

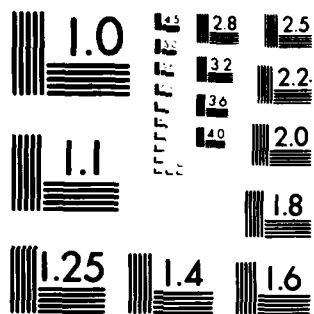
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ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT--ETC F/G 20/11
STRUCTURES AND MATERIALS PANEL. SUMMARY RECORD OF THE PANEL MEE--ETC(U)
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ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT

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STRUCTURES AND MATERIALS PANEL,

SUMMARY RECORD

OF THE

PANEL MEETING (50th) held at

War Museum, Athens, Greece

⑪ 1980

⑫ 1981

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PANEL MEMBERSHIP

As at date of 50th Meeting

BELGIUM

Prof F. BUCKENS	-	-
* Prof A. DERUYTTERE	-	-
Lt-Col A. FOURNIER	-	-
Prof L.J. HABRAKEN	-	-
Prof G. SANDER	-	-

CANADA

* Mr J.A. DUNSBY (by proxy)	o	f
Dr W. WALLACE	o	f

DENMARK

* Prof F. NIORDSON	-	-
--------------------	---	---

FRANCE

Mr J. AUVINET	o	-
Mr P. COSTA	-	-
* Dr G. COUPRY	o	f
Mr J.M. FEHRENBACH	o	f
Mr G. JUBE	o	-
Mr R. LABOURDETTE	o	f

GERMANY

Prof H. FÖRSCHING	o	f
Dr G. GRÜNINGER	o	f
Prof R.J. MEYER-JENS	o	f
* Mr H. ZOCHER	o	f

GREECE

Prof T. KERMANIDIS	-	-
Major M. LIAKOS	-	f
* Col A. SPANOS	o	f

ITALY

Prof E. ANTONA	-	-
Prof C. ARDUINI	-	-
Dr G. BOLLANI	-	-
* Dr C.P. GALOTTO	o	f
Dr G. INCARBONE	o	-
Prof A. SALVETTI	a	-
Prof P. SANTINI	o	f
Lt-Col S. SIGNORETTI	o	f

NETHERLANDS

Mr J.B. de JONGE	o	f
* Dr H.P. van LEEUWEN	o	f
Dr H. TIJDEMAN	o	f

NORWAY

* Mr F. KLOUMAN	-	-
Dr I. KVERNES	-	-
Mr E. MYRVOLD	-	-
Mr T. NAESS	-	-

PORTUGAL

* Dr H.J.G. CARVALHINHOS	o	f
Prof A.F. TOVAR de LEMOS	o	f

TURKEY

Prof D. GUCER	-	-
* Prof M.Ö. KICIMAN	-	-
Dr H. SARICIMEN	-	-
Prof A. YEGINOBALI	o	f

UNITED KINGDOM

Mr N.F. HARPUR	-	-
Mr W.G. HEATH	o	f
Mr J.R. LEE	o	f
Mr D. LEWIS	o	f
* Dr W.G. MOLYNEUX	o	f
Wg Cdr B. ROBSON	o	f

UNITED STATES

Dr H.M. BURTE	o	f
Dr R.M. CARLSON	o	f
Mr F.O. CARTA	o	f
Mr K.I. COLLIER	o	f
Dr L.A. HARRIS	o	f
Mr T.F. KEARNS	o	f
Prof J.W. MAR	-	-
* Dr J.J. OLSEN	o	f
Mr G.P. PETERSON	o	-
Dr E.S. WRIGHT	o	f

* National Panel Coordinators

o = Attended Opening Session of 50th Panel Business Meeting

f = Attended Final Session of 50th Panel Business Meeting

a = Attended Working Activity Sessions only

PANEL OFFICERS AND
PERMANENT COMMITTEE MEMBERSHIP

As at close of 50th Meeting

Panel Chairman	J.B. de JONGE - NL
Panel Deputy Chairman	G. Coupry - FR
Structures Representative	R.J. Meyer-Jens - GE
Materials Representative	W. Wallace - CA
Structures Deputy Representative	P. Santini - IT
Materials Deputy Representative	H.M. Burte - US
Panel Executive	J.M.N. Willis - UK
Panel Secretary	Miss A. Guérillot

POLICY COMMITTEE

J. B. de JONGE - NL (Chairman)

H.M. Burte - US
G. Coupry - FR
N.F. Harpur - UK
W.G. Heath - UK
T.F. Kearns - US
R.J. Meyer-Jens - GE
P. Santini - IT
W. Wallace - CA

TECHNICAL PROGRAMME COMMITTEE

G. COUPRY - FR (Chairman)

H.M. Burte - US
R.J. Meyer-Jens - GE
P. Santini - IT
W. Wallace - CA

EDITORIAL COMMITTEE

W.G. HEATH - UK (Chairman)

J.M. Fehrenbach - FR
J.B. de Jonge - NL
R.J. Meyer-Jens - GE
J.J. Olsen - US

WORKING ACTIVITY MEMBERSHIP

As at close of 50th Meeting
National representative members are underlined thus: UK

AEROELASTICITY - TX.47 (SMP/SC.01)

Sub-Committee - Chairman: G. COUPRY - FR

SMP Members

R.M. Carlson - US
F.O. Carta - US
K.I. Collier - US
H. Försching - GE
N.F. Harpur - UK
W.G. Heath - UK

J.B. de Jonge - NL
W.G. Molyneux - UK
J.J. Olsen - US
P. Santini - IT
H. Tijdeman - NL
A.F. Tovar de Lemos - PO

COMPOSITE MATERIALS - TX.72 (SMP/SC.06)

Sub-Committee - Chairman: G. JUBE - FR

SMP Members

G. Bollani - IT
R.M. Carlson - US
K.I. Collier - US
A. Deruyttere - BE
J.M. Fehrenbach - FR
L.A. Harris - US
W.G. Heath - UK
T.F. Kearns - US
M.Ö. Kiciman - TU
J.R. Lee - UK

H.P. van Leeuwen - NL
D. Lewis - UK
W.G. Molyneux - UK
E. Myrvold - NO
G.P. Peterson - US
B. Robson - UK
S. Signoretti - IT
W. Wallace - CA
A. Yeginobali - TU
H. Zocher - GE

CORROSION FATIGUE - TX.76 (SMP/SC.09)

Sub-Committee - Chairman: H.P. van LEEUWEN - NL

SMP Members

H.M. Burte - US
H.J.G. Carvalhinhos - PO
A. Deruyttere - BE
C.P. Galotto - IT
G. Incarboni - IT
T.F. Kearns - US
J.R. Lee - UK

D. Lewis - UK
E. Myrvold - NO
B. Robson - UK
S. Signoretti - IT
W. Wallace - CA
A. Yeginobali - TU
H. Zocher - GE

Coordinators

J.J. De Luccia - US
R.J.H. Wanhill - NL

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FACTORS OF SAFETY - TX.77 (SMP/SC.14)

Sub-Committee - Chairman: R.J. MEYER-JENS - GE

SMP Members

K.I. Collier - US
J.A. Dunsby - CA
J.M. Fehrenbach - FR
N.F. Harpur - UK
L.A. Harris - US
W.G. Heath - UK

G. Incarbone - IT
J.B. de Jonge - NL
M.O. Kiciman - TU
J.W. Mar - US
W.G. Molyneux - UK
B. Robson - UK

Coordinators

C.J. Schmid - US
H. Struck - GE

CORROSION - TX.80 (SMP/SC.11)

Sub-Committee - Chairman: T.F. KEARNS - US

SMP Members

J. Auvinet - FR
H.J.G. Carvalhinhos - PO
A. Deruyttere - BE
W.G. Heath - UK
J.R. Lee - UK
H.P. van Leeuwen - NL

D. Lewis - UK
J.W. Mar - US
B. Robson - UK
S. Signoretti - IT
W. Wallace - CA
H. Zocher - GE

R & D COOPERATION - TX.82 (SMP/SC.13)

Sub-Committee - Chairman: T.F. KEARNS - US

SMP Members

H.M. Burte - US
H.J.G. Carvalhinhos - PO
K.I. Collier - US
A. Deruyttere - BE
J.A. Dunsby - CA
J.M. Fehrenbach - FR
C.P. Galotto - IT
N.F. Harpur - UK
L.A. Harris - US
W.G. Heath - UK
J.B. de Jonge - NL

M.O. Kiciman - TU
H.P. van Leeuwen - NL
D. Lewis - UK
W.G. Molyneux - UK
E. Myrvold - NO
F. Njordson - DA
G.P. Peterson - US
S. Signoretti - IT
A. Spanos - GR
A.F. Tovar de Lemos - PO
A. Yeginobali - TU
H. Zocher - GE

HELICOPTER FATIGUE - TX.86 (SMP/WG.20)

Working Group - Chairman: J.M. FEHRENBACH - FR

SMP Members

R.M. Carlson - US
J.A. Dunsby - CA
W.G. Heath - UK
J.B. de Jonge - NL
J.R. Lee - UK

D. Lewis - UK
W.G. Molyneux - UK
B. Robson - UK
A. Salvetti - IT
H. Zocher - GE

Non-SMP Members

P. Alli - IT
G. Bretecher - FR
R. Noback - NL

F. Och - GE
W. Schütz - GE

DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES - TX.87 (SMP/SC.15)

Sub-Committee - Chairman: H. FÖRSCHING - GE

SMP Members

R.M. Carlson - US
G. Couprie - FR
N.F. Harpur - UK
W.G. Heath - UK
G. Incarbone - IT

J.R. Lee - UK
W.G. Molyneux - UK
J.J. Olsen - US
H. Tijdeman - NL

MATERIALS FOR SPACE APPLICATIONS - T. 88

ad hoc Group - Chairman: P. SANTINI - IT

SMP Members

C. Arduini - IT
H.M. Burte - US
K.I. Collier - US
J.A. Dunsby - CA
N.F. Harpur - UK
L.A. Harris - US
W.G. Heath - UK
G. Incarbone - IT
J.B. de Jonge - NL

R. Labourdette - FR
J.R. Lee - UK
H.P. van Leeuwen - NL
D. Lewis - UK
J.W. Mar - US
J.J. Olsen - US
A. Salvetti - IT
A.F. Tovar de Lemos - PO
W. Wallace - CA

DYNAMIC RESPONSE TO DAMAGED RUNWAYS - TX.89 (SMP/SC.16)

Sub-Committee - Chairman: J.J. OLSEN - US

SMP Members

K.I. Collier - US
G. Couprie - FR
J.A. Dunsby - CA
H. Försching - GE
N.F. Harpur - UK
W.G. Heath - UK
G. Incarbone - IT
J.B. de Jonge - NL

M.Ö. Kiciman - TU
J.W. Mar - US
W.G. Molyneux - UK
B. Robson - UK
H. Tijdeman - NL
A.F. Tovar de Lemos - PO
A. Yeginobali - TU
H. Zocher - GE

ADVANCED CASTING TECHNOLOGY - TX.91 (SMP/SC.17)

Sub-Committee - Chairman: J.R. LEE - UK

SMP Members

G. Bollani - IT
H.M. Burte - US
H.J.G. Carvalhinhos - PO
A. Deruyttere - BE
C.P. Galotto - IT
H.P. van Leeuwen - NL
D. Lewis - UK

J.W. Mar - US
E. Myrvold - NO
G.P. Peterson - US
B. Robson - UK
W. Wallace - CA
H. Zocher - GE

MAINTENANCE IN SERVICE OF HIGH TEMPERATURE PARTS - TX.92 (SMP/SC.18)

Sub-Committee - Chairman: D. LEWIS - UK

SMP Members

H.M. Burte - US
H.J.G. Carvalhinhos - PO
A. Deruyttere - BE
C.P. Galotto - IT
T.F. Kearns - US
J.R. Lee - UK

H.P. van Leeuwen - NL
G.P. Peterson - US
B. Robson - UK
H. Saricimen - TU
A.F. Tovar de Lemos - PO
W. Wallace - CA

FATIGUE RATED FASTENER SYSTEMS - TX.93 (SMP/WG.21)

Working Group - Chairman: W.G. HEATH - UK

SMP Members

K.I. Collier - US
J.A. Dunsby - CA
J.M. Fehrenbach - FR
G. Incarbone - IT
J.B. de Jonge - NL
R.J. Meyer-Jens - GE

W.G. Molyneux - UK
G.P. Peterson - US
B. Robson - UK
A. Salvetti - IT
A. Yeginobali - TU

Non-SMP Members

To be appointed

EFFECTS OF SHORT CRACKS - T. 94

ad hoc Group - Chairman: H. ZOCHER - GE

SMP Members

H.J.G. Carvalhinhos - PO
K.I. Collier - US
J.A. Dunsby - CA
L.A. Harris - US

J.B. de Jonge - NL
W.G. Heath - UK
R. Labourdette - FR

NDT OF CERAMIC MATERIALS - T. 95

ad hoc Group - Chairman: C.P. GALOTTO - IT

SMP Members

H.M. Burte - US
D. Lewis - UK
S. Signoretti - IT

W. Wallace - CA
H. Zocher - GE

STRUCTURES AND MATERIALS PANEL
SUMMARY RECORD OF THE 50th MEETING

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1. Programme of the 50th Panel Meeting
2. Attendance List
3. Specialists Meeting, Fall 1980
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 - b. Boundary Layer Effects on Unsteady Airloads
4. CFCTP Core Programme Results
5. Terms of Reference
 - a. Manual on Aeroelasticity in Turbomachines
 - b. Dynamic Environmental Qualification Techniques - TX.87
 - c. Materials for Space Applications - T. 88
 - d. Dynamic Response to Damaged Runways - TX.89
 - e. Fatigue Rated Fastener Systems - TX.93
 - f. NDT of Ceramic Materials - T.-95
6. Schedule of Specialists Meetings
7. Working Activities Planning Chart
8. Technical Programmes 1980-1982
9. Status of Publications
10. Personal Action Index

Neuilly, 27 May 1980

SUMMARY RECORD

STRUCTURES AND MATERIALS PANEL 50th MEETING

This Summary Record is intended to be a comprehensive report on the Meeting, together with additional material to provide Members and associates with the information needed to assist their participation in Panel activities.

1. OUTLINE OF THE MEETING

1.1 GENERAL ARRANGEMENTS

The 50th Meeting of the Structures and Materials Panel was held on 13-18 April 1980 at the Hellenic War Museum, Athens, Greece at the invitation of the Greek National Delegates. Detailed arrangements and support were organized by Colonel A. Spanos, Panel Member, and staff from KETA, HAFGS and the War Museum.

1.2 PROGRAMME

The Meeting consisted of the usual Panel Business Meetings, Permanent Committee meetings, one Specialists Meeting and a total of 16 other meetings of Working Groups, Sub-Committee and ad hoc Groups. The Specialists Meeting was on the subject of "Effect of Service Environment on Composite Materials". Pilot papers were also presented to the Aeroelasticity Sub-Committee. Details of the complete Programme are given in Attachment 1.

1.3 OPENING SESSION

The Panel was welcomed to Athens by Maj. General A. Achtidas, HAF, National Delegate for Greece. The traditional Technical Address was presented by Dr A. Iglessis of the Technical University of Athens, in place of Professor P. S. Theocaris who was unable to be present. His subject was "Activités Concernant le Développement des Matériaux Composites en Grèce".

1.4 ATTENDANCE

The Meeting was attended by a total of 214 participants, including 38 Panel Members and Director, AGARD. A complete Attendance List is given in Attachment 2.

1.5 TECHNICAL VISIT

A Technical Visit to the Materials Laboratory of the Technical University of Athens was organized for the Thursday afternoon, 17 April courtesy of Professor Theocaris. Some interesting research on various materials was seen in progress with much appreciation by the participants who numbered over 30.

1.6 SOCIAL EVENTS

A Reception for all participants was held on the Monday evening at the Hellenic Armed Forces Officers' Mess in Athens, where they were welcomed by Major General and Mrs A. Achtidas.

The traditional Panel Dinner took place on the Wednesday evening at the Holiday Inn, Athens and was attended by 90 people. An excellent meal was followed by the customary witty speech from our Panel Chairman and a spirited rendering of further verses of the Panel Song written for the occasion by Mr W.G. Heath, UK.

PANEL SONG
(verses 20-24)

Olympus'mount in silence waits,
The Delphic oracle is dumb,
As SMP now celebrates
Its jubilee - for this we've come.
With fifty meetings to our score,
We plan to hold a hundred more;
(We reckon we'll need forty-three
For Aeroelasticity).

At one time in this golden land,
The citizens came out en masse
To draw their circles in the sand
And learn from old Pythagoras.
So when we talk of lift and drag,
Remember what we owe Pythag;
An engineer is not much use
Without a squared hypotenuse.

And later on, a greater name
Sat on Pythagoras' throne;
Hydraulic systems were his game,
As Archimedes he was known.
A man of Principle was he,
Who left his bath quite hurriedly;
This Greek, a streaker full of hope,
Then shrieked "Eureka - found the soap!"

Young Icarus, a dashing blade,
Invented a new composite;
A pair of wings he quickly made
Of wax and feathers very light.
But when he flew too near the sun,
His feathers soon were all undone;
If only he had learned the arts
Of Maintenance of High Temp Parts!

A new Director joins our ranks
And comes to dine - we wonder why?
Perhaps he'll charge us forty Francs
And sell us each an AGARD tie.
We hope that if he comes to view
Our plans for nineteen-eighty-two,
He'll treat them in a friendly way
And Burnham won't just "Burn'em" say.

2. GROUP AND COMMITTEE REPORTS

2.01 AEROELASTICITY - TX.47 (SMP/SC.01)

2.01.1 Sub-Committee Report by G. COUPRY, Chairman

a. The Sub-Committee on Aeroelasticity met on Wednesday 16 April from 0800 to 1200, to listen to pilot papers and to discuss current activities.

b. Four main presentations took place:

- i) "Effect of Non-Linearities on Wing/Store Flutter"
by G. de Ferrari, IT and A. Lotze, GE
- ii) "Optimization of the Mathematical Model of a Structure"
by H. Zimmermann, GE
- iii) "Comparison Between Calculation and Theory on a ZKP Model for Unsteady Transonic Flow"
by M. Couston, FR
- iv) "Wind Tunnel Test of the Improved YF-17 Wing Store Flutter Suppression System" - An International Effort"
by C. Hwang, US et al.

This last paper was followed by presentation of each of the national efforts, respectively by R. Destuynder, FR, O. Sensburg, GE and M. Turner, UK.

All these presentations were very well received, and the Sub-Committee proposes to the Panel that they are published as three AGARD Reports in the following way:

COUPRY	Paper i) and ii) - together
EXEC	Paper iii) - alone
	Paper iv) and the national presentations - together

MOLYNEUX	c. Mr F.O. Carta reported progress in defining the Manual on Aeroelasticity in Turbomachinery to the Sub-Committee. France accepted to participate in the work by contributing in the preparation. Dr Molyneux and Prof Försching agreed to give their responses to Mr Carta before 1 August 1980. The Terms of Reference for this Manual are given in Attachment 5a.
FÖRSCHING	

OLSEN	d. Dr Olsen reported to the Sub-Committee on the conclusions of the Standard Aeroelastic Configurations Working Group. It is proposed that Mr N. Lambourne, UK be offered a contract to coordinate action on the 2D configuration cooperative activity as described in para. 2.10.1d.
-------	---

e. Small changes are proposed to the programme of the Specialists Meeting on "Boundary Layer Effects on Unsteady Airloads", to be held in September:

- Mr W.J. Mykytow, US will replace Dr Olsen as Chairman of SESSION II
- Recorders of Sessions will be:

EXEC	SESSION I - Mr D.G. Mabey, UK
	SESSION II - Mr J. Giesing, US
	SESSION III - Mr R.J. Zwaan, NL

- Dr Olsen accepted to chair the round-table discussion (SESSION IV)

2.01.2 Panel Discussion

The Panel noted and approved this Report.

2.01.3 Interpanel Action - see paras. 5.1.1, 5.1.2, 5.3.1, 5.6.1.

2.02 IMPACT DAMAGE TOLERANCE OF STRUCTURES - T. 63

2.02.1 Informal Group Report by B. ROBSON, Chairman

a. A special informal group meeting was convened to discuss the difficulties that had arisen in the preparation of the Design Handbook on Impact Damage Tolerance of Structures. Nine people attended, representing seven nations.

b. Mr Collier reported that although the US authorities had cleared Vol.I of the Handbook for publication, they would not accept Vol.II in its present form. They would not allow references to non-releasable information and these must therefore be deleted; some changes in the text may also be necessary. Inclusion of this information in a NATO classified annex was also unacceptable. Also, the draft of Vol.III, promised by the Coordinator in November 1979, had still not been passed to the clearance authorities for comment. The Boeing Co. had been asked to revise Vol.II to meet US official requirements but, although Mr Avery expressed his personal willingness to continue with this task, Boeing had not yet replied officially. Mr Collier was unable to advise on the current state of the three volumes and therefore on likely timescale for their progress towards publication.

AVERY
COLLIER

c. The group agreed that the available information should be published as soon as possible and, therefore, decided that each volume should be published separately. The Coordinator should therefore be asked to amend Vol.I, to include those changes already proposed, and forward the draft to Mr Collier for onward transmission to the Executive. The Coordinator should then amend Vol.II as required by the US authorities, and to minimise overlap with the content of Vol.I, and forward that to Mr Collier; the draft of the revised text would not be circulated to members. Vol.III should be passed to the US authorities for clearance as soon as possible; the draft would be circulated to members for comment when it had been cleared. The Preface and the Introduction, in the form discussed at the 49th Meeting, should be included in Vol.I of the Handbook

COLLIER

d. To achieve this, the following actions are required:

NPC's

i) National Panel Coordinators of nations interested in this topic should nominate a Panel Member to act as focal point for further work associated with this activity; names to be advised to Mr Collier and to the Executive by 30 MAY 1980.

NPC's

ii) National Panel Coordinators to hasten all outstanding comments on the draft Vol.II, to be with Mr Avery by 30 MAY 1980 after which no more changes should be entertained.

HARPUR
AVERY

iii) Each volume will be published separately; therefore Mr Harpur and Mr Avery should prepare the Preface and Introduction for inclusion in Vol.I.

COLLIER

iv) Mr Collier should contact Mr Avery to put these proposals to him and ascertain his intentions and timescales; also he would act as the link between Mr Avery and the Executive.

v) The Executive should take any necessary contract action.

2.02.2 Panel Discussion

a. The Panel noted and approved this Report.

HARPUR

b. In the absence of any formal group monitoring this activity it was requested that Mr Harpur should report on progress at the next Meeting.

2.03 FRACTURE MECHANICS DESIGN METHODOLOGY - T. 64

2.03.1 ad hoc Group Report by H. ZOCHER, Chairman

KLOUMAN
SPANOS

a. The ad hoc Group on Fracture Mechanics Design Methodology met on 14 April from 1430 to 1600 with an attendance of 17 persons. The Chairman opened the meeting and presented the status of the AGARDograph which is now in the printing stage. The Coordinator indicated that the AGARDograph will include a subject and author index. It is planned to distribute about 1600 copies. Distribution lists are required from Norway and Greece. The lists should be sent to the Executive by 15 MAY 80. Expressions of thanks were made by the Chairman to the Coordinator, Dr H. Liebowitz, US for organizing and editing the AGARDograph which is receiving considerable interest. The Coordinator also expressed his thanks to the Working Group members and the Chairman for their assistance in meeting the objectives of the Working Group.

b. The ad hoc Group discussed what, if any, activities should be planned for the future. After exchanging ideas on a number of proposals, there was a narrowing down to two specific subjects:

- Effects of short cracks in aeronautical components
- Fracture mechanics of composites

In the first effort on short cracks, interest was expressed in cracks of one tenth of a millimeter in length occurring in corners, holes and surfaces. Short cracks in a row of rivet or bolt holes were of special interest with regard to the possibility of joining of such cracks possibly precipitating failure. Interest was also expressed in obtaining stress intensity factors for various cases in which short cracks were experienced; this would also include finite element analyses. The possibility of initiating a round robin activity in predicting crack propagation was also mentioned.

Fracture mechanics of composites should include studies indicating when fracture mechanics could be applied as well as when fracture mechanics is not appropriate in analyzing composites. A possible future activity in this area should include theoretical as well as practical considerations. The effect of damage was also discussed.

c. The Group was of the opinion that fracture mechanics is an important point in aircraft design and, therefore, should be of special interest to this Panel. Fracture mechanics activities should be continued specifically in the above mentioned areas. In order to define more explicitly the task to be undertaken, it was felt that two pilot papers should be presented in each of the above mentioned areas concerning short cracks and composites. The ad hoc Group participants should come prepared at the next Meeting to propose specific authors and subjects to be considered as pilot papers for the Spring 1981 Meeting; these pilot papers will form the basis of a possible forthcoming Specialists Meeting to take place in Fall 1982. The ad hoc Group members, and also members of the Composite Materials Sub-Committee, should be prepared to recommend possible authors and titles of papers to be presented at a Specialists Meeting in Fall 1982. Proposals should be forwarded on both subjects and sent to the Chairman, with copies to the Coordinator and the Group members. Papers should present the state-of-the-art existing in each country.

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Possible presenters of pilot papers in the area of short cracks would be:

- Rooke and Cartwright (UK)
- Tiffany and Wood (US)

d. In the area of composites, it was suggested that the different views should be presented as to whether or not fracture mechanics analyses are applicable to composites. Possible speakers could include people from the USAF, NASA-Langley and others. The proposals of this ad hoc Group relating to composites should be referred to the Composite Materials Sub-Committee meeting on Thursday 17 April so that future planning could be coordinated with the composites specialists. They, hopefully, will be able to suggest appropriate participants in the future effort of the ad hoc Group on Fracture Mechanics.

2.03.2 Panel Discussion

a. The TPC had recommended that, because of the interest in both of the proposed subjects for Specialists Meetings (see also para. 2.04 below) plans should be made for a Meeting on the effects of short cracks in Fall 1982 and on fracture mechanics of composites in Spring 1983. If possible, pilot papers on short cracks should be presented at the next Meeting, rather than Spring 1981, in order to expedite planning.

ZOCHER b. The Panel supported the proposal for two Specialists Meetings but accepted that pilot papers on short cracks would not be presented until Spring 1981. An ad hoc Group, under the chairmanship of Mr Zocher, was formed to undertake the activity on the effects of short cracks and to establish Terms of Reference at the next Meeting. Initial membership of this Group is given on page (iii).

c. The proposed Specialists Meeting on fracture mechanics of composites should be further considered at the final meeting of the Composite Materials Sub-Committee in Fall 1980. (See para. 2.04.2 below).

2.04 COMPOSITE MATERIALS - TX 72 (SMP/SC.06)

2.04.1 Sub-Committee Report by G. JUBÉ, Chairman

a. The Specialists Meeting on "Effect of Service Environment on Composite Materials" was held, as scheduled, on 14-17 April 1980 in Athens, Greece. The six Sessions were attended by a fairly constant level of 140 participants. The Meeting ran smoothly according to the plan and the timing. Only one cancellation of paper occurred and the 21 contributions were attentively followed. The large amount of time reserved to discussions and roundtable was entirely and profitably used.

b. The ambitious objective of the Meeting was the assessment of the present level of knowledge of the behaviour of composites when submitted to all the various types of aggressions in the environment. It can be considered that this review was particularly opportune, the preliminary development period of the technology being now completed and the application era already entered.

c. It can probably be considered that, due to the quality of the papers and the competence of the lecturers, this objective has been reached. The incertitudes of some features of the behaviour of the material, and especially the difficulty of modelizing parameters which could lead to accurate theoretical previsions, are to a large extent overcome by experience in service covering already millions of flight hours. This experience proves, in general, extremely favourable and the comprehensive initial reluctance of civil and military operators turns out to be now a motivated acceptance. The papers, as well as the reports from the rapporteurs will, when published, constitute the best reference book on this fundamental subject.

d. The Sub-Committee considers then that the Specialists Meeting was a success, with, however some remarks:

- The attendance sheets followed an erratic path and a number of participants did not register
- The interpretation proved to be of unequal quality, especially in the French-to-English sense
- The number of copies was insufficient and some papers were difficult to follow without a written text. This problem should be solved for future Meetings.

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e. Regarding future action, the Sub-Committee envisages a Specialists Meeting which could encompass two fundamental aspects in the use of composite materials:

- Fracture mechanics
- Characterization and significance of defects.

This could lead to two successive sessions to be held in a common 2 1/2 days Meeting. It could take place, according to SMP possibilities, in Spring 1983. Some informal contacts can be taken from now, in order to determine the possibilities of the different countries for contribution. The Terms of Reference could then be drafted at the next Meeting. An alternative subject for a future Meeting could be "Procedures of Certification of Composite Structures".

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f. The future status of the Sub-Committee, as well as that of the Fracture Mechanics ad hoc Group is to be determined, and a solution to be found in order to allow them to work in conjunction. This problem should also be solved at the next Meeting

g. A contribution of the Composite Sub-Committee can also be envisaged for the Fall 1982 Meeting on "Environmental Effects on Materials for Space Applications".

2.04.2 Panel Discussion

a. The Panel supported the proposal to hold a Specialists Meeting in Spring 1983. It was understood that the proposed title would be "Characterization and Significance of Damage in Composite Materials". Terms of Reference would be drafted at the final meeting of the Composite Materials Sub-Committee in Fall 1980.

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b. It was noted that several Panel Members from the structures area would be interested in participating in this activity.

c. It was confirmed that the envisaged contribution to the Fall 1982 Meeting on Materials for Space Applications (para. 2.04.1g above) took account of the change in direction of that activity.

2.04.3 Executive Note

a. With regard to the comments in para. 2.04.1d above, it is believed that, in fact, a full record of the names of all participants was obtained. The lack of copies of pre-prints was due to several factors; the unexpectedly large number of participants, delay in the mail and the failure of some authors to observe the request for copies. The Executive proposes that, in future, he should send a reminder to all authors about 6 weeks before a Meeting, amending the numbers required if necessary.

2.04.4 Interpanel Action - see paras. 5.1.2, 5.2.1.

2.05 CRITICALLY LOADED HOLE TECHNOLOGY - TX.73 (SMP/SC.05)

2.05.1 Sub-Committee Report by G.P. PETERSON, Chairman

HEATH a. This was the final meeting of the Sub-Committee. The draft report will be sent to Panel Members as soon as possible for review and comment. Participants have already received the draft and comments are expected back by 1 MAY 1980. All editorial comments from Panel Members will be forwarded to Mr Heath. He will compile and send overall comments to Mr Urzi, US by 1 AUGUST 1980.

b. All Panel Members will send technical comments to Mr Urzi as soon as possible. It is expected that a final camera-ready copy of the report will be sent to the Executive in September 1980 for publication.

2.05.2 Panel Discussion

a. The Panel noted and approved this Report. This Sub-Committee should now terminate.

2.05.3 Executive Note

a. The meeting of this Sub-Committee was followed by a preparatory meeting for the Working Group on Fatigue Rated Fastener Systems which will formally convene in Fall 1980. A report is given in para. 2.17.

2.06 CORROSION FATIGUE - TX.76 (SMP/SC.09)

2.06.1 Sub-Committee Report by H.P. van LEEUWEN, Chairman
R.J.H. WANHILL and J.J. De LUCCIA, Coordinators

a. The Sub-Committee meeting convened at 0810 with 14 members representing 9 countries (UK, CA, GE, PO, NL, GR, TU, US and SW) participating. At the meeting the Coordinators updated the status of the Corrosion Fatigue Cooperative Testing Programme (CFCTP). The status of participation in the core programme by 8 laboratories was given by the Coordinators. It is expected that most of these laboratories will have completed the core programme by the end of 1980.

b. Three laboratories (NLR, DFVLR and NADC) have partially completed the core programme. Results as per 10 April 1980 are presented in Table 1 and Figure 1 (Attachment 4). It is too early to speculate on the differences in results between laboratories although the differences do appear to be significant. The results can be summarized as follows:

1. There is a fair amount of scatter in the data. Thus the requirement of testing four specimens per test condition is not excessive.
2. For uncorroded specimens fatigue tested in air, the inter-laboratory differences in lives were small.
3. For specimens tested at the higher stress level (210 MPa) the NLR found the influence of pre-exposure on fatigue life to be of secondary importance compared to the influence of fatigue testing in salt spray.
4. The DFVLR and the NADC found a stronger influence of pre-exposure on fatigue life. At the higher stress level (210 MPa) the DFVLR found pre-exposure to be more detrimental than changing from air to salt spray for fatigue testing.

c. Dr De Luccia then presented an Analysis of Variance Method that will be used to analyze the core programme data. This will ensure that the significance of any variation in empirical data will be properly assessed.

d. In view of the data scatter it is considered especially important that all participants report the fatigue failure origins as accurately as possible, in the manner proposed on page 74 of the CFCTP manual. In addition, the NLR wishes to examine the fracture surfaces of core programme specimens and requests participants to send one-half of each specimen. These will be returned if so desired. All participants are requested to report the exact procedure followed after pre-exposure, i.e. whether after rinsing and air drying at 323 K the specimens were fatigue tested immediately or stored in a desiccator to await testing. Participants are also requested to measure the pH of the solution after pre-exposure. NLR results indicated a variation between pH 1.5 and pH 2. Finally all participants are requested to report the sequence in which all core programme specimens were tested, i.e. the dates at which the specimens were tested, in order to enable evaluation of the possibility of "start-up" error.

e. The current status of anticipated supplemental testing was then presented by the Coordinators, namely:

NATL REPS
(US,CA,FR
GE,UK,NO)

NADC - Advanced corrosion protection schemes, flight simulation and alternate immersion (salt water) testing on specimens identical to those in the core programme.

AFML - Sleeve insert fasteners, flight simulation.

UNIVERSITY OF SASKATCHEWAN - Flight simulation on core programme-type specimens.

VOUGHT - No details as yet.

NLR, NDRE, IABG, Delft University, Aérospatiale - coordinated programmes involving flight simulation testing on common materials, 7075-T-76 with FALSTAFF (manoeuvre spectrum) and 2024-T3 with MINITWIST (gust spectrum) and specimens geometrically identical to core programme specimens but using a variety of corrosion protection schemes.

RAE - No details as yet.

SAAB - Tests on core programme-type specimens using alternate immersion and condensation with plain water.

f. In view of the scope and complexity of the total programme (core + supplemental), it is suggested that the CFCTP activity terminate upon completion of the core programme in order to allow timely reporting of data. It is intended to report on the core programme (1) at the Specialists Meeting in April 1981 and (2) in an AGARD document to be published in Fall 1981. This document will comprise the CFCTP testing manual and a complete analysis of core programme results.

g. It is proposed that the supplemental testing be continued as a new activity under the possible Sub-Committee title of "Aircraft Environment Simulated Fatigue Testing". This new effort will require new Terms of Reference with clearly defined objectives and scopes of the programmes of the various participating laboratories. This will afford the opportunity to maximize the benefits of coordinated activities between the laboratories, and also will enable hitherto unexplored aspects of environment fatigue to be considered.

h. Finally, the meeting was concluded with a discussion of the format of the Specialists Meeting on Corrosion Fatigue to be held in April 1981. It was proposed that the Coordinators present the achievements of the core programme in two papers. The first paper will discuss the objectives and scope of the core programme and the second paper will present an analysis of the results. All core programme participants will be given the opportunity to make brief statements concerning specific aspects of the tests. This part of the Meeting would take somewhat less than half a day.

j. It was suggested that additional papers from experts in the field of corrosion fatigue be solicited. These papers, to a maximum number of four, would be concerned with:

- mechanisms, e.g. fatigue initiation in aggressive environments
- corrosion fatigue in structural elements.

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National representatives are requested to solicit papers from authors tentatively identified below and to send full details to the Sub-Committee Chairman not later than 30 JUNE 1980. These papers will be published as a separate AGARD document. The possible authors are the following:

Prof David Duquette - Rensselaer Polytechnic, USA
Dr P.J.E. Forsyth - Materials Dept, RAE, UK
Prof David Hoepfner - formerly USA, now Canada
Prof Iain Le May - University of Saskatchewan, Canada
Dr Walter Schütz - IABG, Germany
Prof M. Doruk - METU, Turkey

Possibly also a contribution from France

Additional papers would be welcome from these or other nations.

2.06.2 Panel Discussion

- a. It was pointed out that, at the Spring 1981 Specialists Meeting, there might be a need for time for detailed discussion of possible differences in test results. Dr van Leeuwen confirmed that the intention was to allow ample time during the first half-day.
- b. The Panel approved the plan to hold a one-day Meeting in Spring 1981, with the possibility of an extension to 1 1/2 days.
- c. Preparation of Terms of Reference for a continuation activity, referred to in para. 2.06.1g, would probably not be undertaken until Fall 1981.

2.07 FACTORS OF SAFETY - TX.77 (SMP/SC 14)

2.07.1 Sub-Committee Report by R J. MEYER-JENS, Chairman

- a. The Group met on Wednesday 16 April 1980 between 1230 and 1500. The meeting was attended by 13 individuals, 10 of them being Panel Members.

b. Action items from 49th Panel Meeting

The action items from the last Meeting have been fulfilled, except that the Coordinators could not arrive at one unified compilation of data because the authorities did not answer by the deadline, defined as the end of 1979. For Europe, Mr Struck, GE was just able to put all answers received into the chosen format whereas, for North America, Mr Schmid, US brought the latest answers, compiled question by question, to the present Meeting.

c. Actions during 50th Panel Meeting

1. As a first step Mr Struck reported on which authorities had answered the questionnaire or not; 21 authorities had been addressed. Answers have been received from 16 authorities; in addition SAAB-SCANIA answered for the Swedish Air Force and the Swedish Board of Civil Aviation commented by letter. No answers have been received from the Belgian Civil Authority, Netherlands Air Force, United Kingdom-CAA, US-Naval Air Systems and United States-FAA.

2. For Europe Mr Struck presented his compilation and evaluation of the answers to the questionnaire that he had received. He did so by commenting on the viewgraphs taken from his written report. The written report was distributed to all members of the Sub-Committee. For North America Mr Schmid supplemented this presentation on the basis of the additional answers that he had received; the written compilation was also distributed.
3. A lively discussion arose round those points where obvious misunderstandings in answering questions must have occurred. These are the points to be clarified by personal discussion with the authorities concerned.

d. Decisions taken during the 50th Panel Meeting

- As some of the major Civil Authorities did not answer, the Sub-Committee decided to exclude the answers from civil authorities from all future evaluation, because a limited evaluation would not be worthwhile.
- The format for compilation and evaluation chosen by Mr Struck will be used for the further work of evaluation.

e. Actions resulting from 50th Meeting

MEYER-JENS

- Chairman of Sub-Committee has to write to all those civil authorities who answered the questionnaire, thanking them for their kind cooperation and informing them of the decision mentioned above.
- Mr Schmid will bring the additional answers from US authorities into the condensed form of the format within 3 weeks after the Meeting.
- By the first week of June, all answers will be put together in one document, following the format chosen by the Coordinators.
- On the basis of this document, both Coordinators will address the authorities concerned to clear "open items" by personal discussion. (With respect to the summer holidays, not all of these discussions may take place before the next Meeting).

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- The aforementioned document will be distributed to all members of the Sub-Committee; members are kindly asked to send in comments.

NPC's

- Representatives of all military authorities who have answered are to be invited to take part in a round-table discussion during the next Meeting in Fall 1980. This invitation should be sent out by the appropriate National Panel Coordinator, together with hotel booking information, not later than 30 MAY 1980.
- Messrs Struck and Schmid will send a listing with names and addresses of the authorities concerned to the NPC's and to the Chairman of the Sub-Committee right after this Meeting.
- Following these lines, all members of the Sub-Committee and all authorities concerned may enter discussions at the Fall Meeting well prepared.

SCHMID
STRUCK - Following the Fall Meeting, the Coordinators have to include the results of the personal discussion with authorities and the round-table discussion into the evaluation and distribute the draft report to all Members of the Sub-Committee for final comments and agreement. The camera-ready report will then not be ready in November 1980, but hopefully at the end of January 1981.

2.07.2 Panel Discussion

ZOCHER a. The Panel supported the proposals to concentrate on the military authorities and to hold a round-table discussion in Fall 1980. Any Swedish representative at the latter will need to be sponsored by a Norwegian National Delegate.

2.07.3 Interpanel Activities - see para. 5.1.2.

2.08 CORROSION - TX.80 (SMP/SC.11)

2.08.1 Sub-Committee Report by T.F. KEARNS, Chairman

a. The Sub-Committee met, with representatives of CA, FR, GE, GR, IT, NL, TU, UK and US attending. Discussion of the program previously planned concentrated attention on the preparation of the Handbook and on plans for a Specialists Meeting on Aircraft Corrosion in Spring 1981.

b. HANDBOOK - The Handbook is to be a multi-volume publication with sections on Theory and Case Histories; Requirements in Procurement; Airframes; Equipment; Maintenance; Electrical; and R&D. Since the last meeting, the case histories for Vol. I originally provided by Canada were augmented by submittals from US, BE, GR, NL and UK, providing most if not all of the case histories required. NL has additional information ready for transmittal. It was not possible for AGARD to arrange for the services of Dr Brown, US, as coordinator and inquiries are being made currently by NL to identify another editor. If these discussions are successful, Vol. I of the Handbook will proceed as planned, with completion estimated to be within 1-2 years. If the NL discussions are not successful we plan to reduce the extent of the theory content of Vol. I and publish that Volume as a brief description of types of corrosion with the case history information already available. This would be completed in 1981.

c. SPECIALISTS MEETING - The Specialists Meeting planned for Spring 1981 will attempt to increase the dialogue between the R&D and the Maintenance communities. This objective is seen also as means of increasing attention, in the Panel's program, to the interests of the smaller nations which operate and maintain aircraft but do not build them. The meeting will be organized in four Sessions and will require two days.

SESSION I - This Session will be devoted to the general topic of maintenance experience and the needs of the maintenance community. Papers and some authors were identified from FR, TU, UK and US. Dr W. Wallace will be Session Chairman and A.J.A. Mom, NL will be Session Recorder.

SESSION II - This Session will concentrate on the engineering aspects of corrosion. Papers and some authors were identified from FR, IT, NL, UK and US. Wg.Cdr Bright, RAF will be Session Chairman and the UK will arrange for a Session Recorder.

ROBSON

SESSION III - The third Session will be devoted to research and development work and to best anti-corrosion practice. Papers and some authors were identified from GE, TU, UK and US. Prof Kiciman or Prof Yeginobali will be Session Chairman and Dr De Luccia, US will be Session Recorder.

SESSION IV - The final Session will be a discussion period intended to maximize the interchange between R&D and maintenance communities. There will be no papers presented. However, the Session Recorders will introduce their areas with brief presentations and a Discussion Leader will stimulate discussion from all meeting participants. The Discussion Leader is to come preferably from the maintenance community. Mr Browne or Mr Myers, US were suggested for this task. The Sub-Committee Chairman will explore this subject. Discussion will be recorded and will be presented in written form by the Recorder for Session IV. Dr Wanhill, NL will undertake this task. Mr Auvinet, Wg.Cdr Robson, Colonel Signoretti, Dr W. Schütz, GE, Dr van Leeuwen and Professor Yeginobali will send names, addresses and papers titles to the Sub-Committee Chairman by 30 JUNE 1980. The Chairman will send the tentative meeting program, including this information, to the Panel Executive by 31 JULY 1980.

KEARNS

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van LEEUWEN
ROBSON
SIGNORETTI
SCHÜTZ
YEGINOBALI
KEARNS

d. VOLUME II - This volume of the Handbook is to be addressed to the people who buy aircraft and is to concentrate attention on the requirements that should be placed on aircraft in the procurement phase. It is also intended to provide the procurement community with information which will place the subject of corrosion protection in proper perspective. As previously arranged, a partial information base for this volume has been collected by the Sub-Committee Chairman with submittals of procurement specification data from BE, FR, NL, UK and US. Dr W. Schütz will confirm the availability of similar data from GE. Dr Wright is to provide the Chairman with some additional US information, and Mr Lewis will explore the availability of additional cost information from the UK. This data base will be reviewed by the Chairman prior to the next Panel Meeting. At that time, detailed plans will be made for Volume II, its content, preparation and publication.

SCHÜTZ
WRIGHT
LEWIS

2.08.2 Panel Discussion

a. The Panel noted and approved this Report

2.08.3 Interpanel Action - See para. 5.1.2

2.09 R&D COOPERATION - TX.82 (SMP/SC.13)

2.09.1 Sub-Committee Report by T.F. KEARNS, Chairman

a. The Sub-Committee met with BE, CA, FR, GE, GR, IT, NL, PO, TU, UK and US in attendance. The Director of AGARD attended the meeting and played a leading role in Sub-Committee discussions. He presented AGARD and NATO policy on augmented support of the Southern Flank nations and reported that additional resources have been allocated for this purpose. The Sub-Committee Chairman outlined the prior activities of the Sub-Committee in increasing cooperation between the more and the less fully developed nations of NATO. Initially the less fully developed nations (LDN) informed the developed nations (DN) of their capabilities in R&D. Next LDN informed DNs of their R&D interests. This was followed by information from the DNs to the LDNs on the major thrust areas in R&D. LDNs responded with specific R&D project suggestions. It was noted that success in establishing a cooperative R&D program seemed to require individual personal contact between the LDN scientist and his counterpart in the DN and that AGARD support of travel for this purpose, when required, would be most helpful in establishing and maintaining such programs.

b. The observation was made that organizations in the DN's encounter periods when the amount of mechanical testing (e.g. fatigue) exceeds their equipment capacity, thus presenting an opportunity for LDN's to participate in their program with mutual benefit. In order to make this practicable within time constraints it is necessary that the DN organizations know in detail what testing equipment is available in the LDN's so that a potential testing source can be rapidly identified. Col Spanos, Dr Carvalhinhos and Prof Yeginobali will send a list and description of such equipment to the Sub-Committee Chairman for circulation in the DN's. The Director of AGARD suggested that distribution of this information not be limited to Panel Members but be made more widely in DN's.

c. In addition to personal contacts in developing cooperative programs, the Sub-Committee identified short courses on appropriate topics, an increase in the size of research grants made by the Science Committee of NATO, modest funds for equipment maintenance, repair or augmentation when foreign exchange problems are encountered and active participation of SMP Members, as actions beneficial in achieving Sub-Committee objectives.

d. A review was made of the status of cooperative R&D program development involving GR, PO and TU with the following actions identified:

GR - Flutter clearance of aircraft (GE); Fatigue life monitoring, fracture mechanics and crack propagation (FR).

PO - Processing of metals (US); Isothermal forging (CA); Short course on fracture mechanics (US)

TU - Composite Materials (GE); Creep (UK); Thermomechanical treatment of steels and aluminum (US, PO); Fluxes for boron steels (GE, US); Mössbauer effects (GE); Mineral processing (UK, CA); Combustor modelling (UK, US); Raindrop behaviour (CA, US); jet turbulence (UK); Turbomachine design (BE, UK, US); Oscillating airfoils (GE, US).

SPANOS
CARVALHINHOS
YEGINOBALI
KEARNS

Recommendations from TU on training of engineers, AGARD scholarships, development of a guidance and control system, NATO missile and new structural materials, and help in finding loans for establishing laboratories, were also noted.

SPANOS
CARVALHINHOS
YEGINOBALI

e. In order to proceed as rapidly as possible in development of cooperative programs, Col Spanos, Dr Carvalhinhos and Prof Yeginobali will identify the travel support that would be needed in connection with the above programs, in the event that the programs are to proceed under AGARD sponsorship, and will send to the Executive by 2 JUNE 1980 (copy to the Sub-Committee Chairman) a brief description of the project and the travel that would be required. This will be done only for those projects that could proceed without other roadblocks (e.g. unavailability of equipment).

f. The Sub-Committee expressed its thanks to the Director of AGARD for his guidance and assistance and assured him of its desire to participate dynamically in the current NATO thrust. In so doing the Sub-Committee will continue its efforts in developing mutually advantageous R&D cooperation between all of the NATO nations

2.09.2 Panel Discussion

a. Director, AGARD expressed a note of caution with regard to the list of Turkish interests in para. 2.08.1d above. This does not represent a formal statement from their National Delegates. He will visit Turkey in early Summer, will clarify their needs and priorities and distribute this information to appropriate Panels

2.09.3 ADVISORY SESSION - Report by T.F. KEARNS and A. SPANOS, Chairmen

a. A meeting of Panel Members and other Meeting participants was held for the purpose of addressing specific interests of Greece, in accordance with Panel plans made at the last Panel Meeting. Three principal subjects were addressed: Service Life Fatigue Prediction; Aircraft Flutter Clearance and Composites, with the following results:

b. SERVICE LIFE FATIGUE PREDICTION - In order to build a capability in Greece in aircraft fatigue life prediction, a cooperative program was outlined covering fatigue life monitoring, failure and crack propagation and fracture mechanics. This will involve interaction between KETA (GR), CEAT (FR), ONERA (FR) supplemented by additional participation by institutions in other nations as appropriate. It is intended that this program will make it possible for Greece to predict the remaining life of operational Greek aircraft and to develop a sound maintenance and repair policy and practice. AGARD support of some travel expenses will be requested for support of this program. Col Spanos will send to the Executive by 2 JUNE 1980, an outline of the program to be undertaken and an indication of the travel support required.

SPANOS

c. AIRCRAFT FLUTTER CLEARANCE - In order to be able to clear aircraft for flight with stores, or combinations of stores not already cleared in flutter, Greece will develop the capability to provide such clearance for its aircraft. A program to support development of this capability in Greece was outlined at this meeting. This will involve interaction between KETA (GR) and DFVLR (GE) with appropriate participation by the AFFDL (US) and organizations in other nations as appropriate.

SPANOS

This will afford the Hellenic Air Force the flexibility to operate its aircraft with required store configurations without inordinate time and cost penalties. AGARD support of some travel expenses will be requested in support of this program. The Panel reviewed the subject and the program approach envisioned and concurred in the technical soundness of the program to be undertaken. Col Spanos will send to the Executive by 2 JUNE 1980, an outline of the program to be undertaken and an indication of travel support required. The Director of AGARD indicated that he would inform the appropriate German National Delegate of the results of discussions at this meeting.

d. COMPOSITE MATERIALS - A general discussion was held between Panel Members, other meeting participants and Greek representatives including those from the National Technical University of Athens. Topics discussed included application areas, failure modes, inspection, repair criteria and procedures, manufacturing of fibres, matrix materials and lay-up configurations. Greek participants felt that the session was profitable for them.

In order to make future meetings of this type even more advantageous it was suggested that information on topics to be discussed and particular questions on which information is desired should be made known to Panel Members in advance of the meeting.

2.10 STANDARD AEROELASTIC CONFIGURATIONS - TX 84 (SMP/WG.19)

2.10.1 Working Group Report by J.J. OLSEN, Chairman

a. The Working Group concluded its business at this meeting and was able to cancel the proposed meeting at the Royal Aircraft Establishment on 21 April 1980.

WG
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b. The Working Group received the Coordinator's draft report for three-dimensional (3D) configurations and each member agreed to send his final comments to the Coordinator by 31 MAY 1980. The draft report specified three "conventional" 3D wings. The Working Group agreed to add two supercritical wings.

1. The GELAC/NLR/FDL/NASA wing (clean)
2. The ZKP wing (with oscillating flap)

TIJDEMAN
ZIMMERMANN

BLAND

c. Dr Tijdeман agreed to provide all necessary geometry and condition data for the GELAC/NLR/FDL/NASA wing by 31 MAY 1980. Similarly Mr Zimmermann agreed to provide all necessary data for the ZKP wing by 31 MAY 1980. The Coordinator is to submit his final 3D report to the SMP Executive by 31 AUGUST 1980.

EXEC
OLSEN

d. The Working Group recommends that the Sub-Committee on Aeroelasticity develop a compendium of all available data for the earlier set of 2D airfoils. This would include geometries, Mach numbers, other appropriate conditions, steady and unsteady aerodynamic predictions and experimental data, and flutter data. The Working Group recommends that the Sub-Committee on Aeroelasticity consider Mr N. Lambourne, UK (formerly of the RAE) as an editor with the possible assistance of Mr H.C. Garner of the RAE. The SMP Executive has agreed to explore the possibility of an AGARD contract for the compilation and editing of the compendium. Dr Olsen agreed to explore the possibility of USAF funds through EOARD to augment the AGARD funds.

e. The Working Group has now completed its work and leaves future actions to the consideration of the Sub-Committee on Aeroelasticity. The Chairman would like to express his appreciation to the SMP and FDP Members who participated in the Working Group. Special thanks are also due to the non-Panel members who gave unselfishly of their time and expertise, and made the activity a great success. Our special appreciation goes to Dr G. Coupry of ONERA who first suggested the need for aeroelastic applications of transonic unsteady aerodynamics. He is, in fact, our "Standard Aeroelastician" to whom we all look for guidance and professional example.

2.10.2 Panel Discussion

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a. The Panel supported the proposal to develop a compendium of data as outlined in para. 2.10.1d. A potential basis for funding would be that EOARD might provide funds for travel in the USA, and possibly an honorarium, while AGARD might fund travel in Europe. The tasks and travel required need to be defined.

b. It was agreed that the Working Group should now terminate. A new activity should be proposed at the next Meeting to undertake the preparation of the proposed compendium.

2.10.3 Interpanel Action - Dr Olsen expressed his appreciation for the assistance received from FDP

2.11 HELICOPTER FATIGUE - TX 86 (SMP/WG-20)

2.11.1 Working Group Report by J.M. FEHRENBACH, Chairman

a. The Group held a short meeting on Wednesday morning with the attendance of 12 participants.

b. No major change has been proposed for the programme of the Specialists Meeting on Helicopter Fatigue Life Assessment to be held in Aix-en-Provence at the Fall 1980 Meeting. Some minor modifications have been recorded and decided:

- Messrs D.C. Borgman and C.H. Carper, US will not be able to travel to France in September so that Dr Carlson will be in charge of presenting both relevant papers, and a new Rapporteur must be designated before 15 MAY 1980.

- Discussions will take place at the end of each Session only.

c. It was confirmed that no definitive proposal could be made regarding the Handbook before the conclusion of the Specialists Meeting in Aix. However, in order to progress further at the next Meeting it was decided that:

FEHRENBACH
WG
MEMBERS

- The Working Group Chairman will propose a general layout of the content on the basis of the proposals to be sent by Working Group Members before the end of June.

WG
MEMBERS

- Working Group members should make investigations for a possible Editor before the Aix Meeting so that the man who accepts this task could attend the Meeting. No proposal for a candidate has been recorded up to now although the question has already been raised and discussed in UK and in France. It appeared that a recently retired specialist could be an excellent candidate and an English speaking man would be preferred.

d. The Group requests an allocation of 2 1/2 hours after conclusion of the Specialists Meeting in order to discuss the proposed Handbook content.

2.11.2 Panel Discussion

a. The Panel noted and approved this Report.

2.11.3 Interpanel Action - See para. 5.1.2.

2.12 DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES - TX.87(SMP/SC.15)

2.12.1 Sub-Committee Report by H. FÖRSCHING, Chairman

a. The meeting of the Sub-Committee was attended by about 20 people. It was opened by the Chairman with a brief review on the activities performed since the last meeting. Following the actions requested at the Fall 1979 Meeting, the tentative papers for the planned Specialists Meeting, collected by the Sub-Committee members in their countries, have been presented. The first survey resulted in a total of 28 papers.

b. During the subsequent discussion, an attempt was made to define these papers with respect to the following areas of activity, which may serve as Session topics for the Specialists Meeting scheduled for Fall 1981:

1. Overview (8 papers)
2. Applications (14 papers)
3. Theory and Testing - Extension of Methods (6 papers)

Since only 1 1/2 days is scheduled for the Specialists Meeting, the number of the offered papers must drastically be reduced to about 15-16 papers, appropriate to the above mentioned topics. In order to do that, a committee has been nominated consisting of Mr Perisho, US, Mr Lodge, UK and Mr Haidl, GE. It was agreed that these gentlemen should make a corresponding selection of the papers. A final selection of the papers and the provisional programme for the Specialists Meeting should then be made at the Fall 1980 Meeting.

FÖRSCHING

c. Considering the vivid interest expressed by all participants in this important technical subject, and the number of papers offered, it was proposed to try to extend the Specialists Meeting to 2 days. Further discussions arose as to whether or not related helicopter activities should be dealt with. It was the general feeling that this should be done at least in the form of an overview paper. If possible, this paper could be presented prior to the Specialists Meeting, at the next Meeting. This will be checked and a definite decision will be made by 31 MAY 1980.

2.12.2 Panel Discussion

a. The Panel approved the TPC proposal to extend the duration of the Specialists Meeting to 2 days.

2.12.3 Executive Note

a. The revised Terms of Reference of this Sub-Committee are given in Attachment 5b.

2.13 DIMENSIONALLY STABLE STRUCTURES FOR SPACE - T. 88

2.13.1 ad hoc Group Report by P. SANTINI, Chairman

a. The meeting was held on 15 April and was attended by 12 Panel Members and 4 other participants. As a result of previous discussions between Prof Santini and Dr Harris, new Terms of Reference were proposed, based on the pilot papers presented at the last Meeting. There seems to be a need to concentrate more on the materials aspect of the problems of space activity than on that of the structures. Thus, the new Terms of Reference focus on the influence of environment on the physical and mechanical properties of materials for space applications.

b. Most of the audience concurred on the importance of the subject and on its adequacy to the aims and scope of SMP but there was a general concern about the composition of the Group which consists almost entirely of Members from the structural side; there was a general consensus that new Members from the materials area should join the Group.

c. It was decided:

1. To ask a small committee to prepare the new Terms of Reference; this committee, P. Santini, L.A. Harris, R.J. Meyer-Jens and S. Ahmed (CA), has completed the work and the final document was submitted to the TPC for approval. This is reproduced as Attachment 5c. The purposes of the activity are now clearly and firmly defined and sufficiently narrowed for future actions.
2. To check the interest of the individual members of the ad hoc Group and to see what changes in the composition are desirable.
3. To re-convene at the next SMP Meeting in order to appoint a Sub-Committee which should take in hand the preparation of the Specialists Meeting for Fall 1982; no further delay should be foreseen.

2.13.2 Panel Discussion

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LEE
van LEEUWEN
LEWIS
WALLACE
- a. The Panel approved a change in the title of this ad hoc Group to "Materials for Space Applications" and the change in direction implied by the proposed new Terms of Reference. Five Panel Members from the materials area indicated their interest in taking part in this activity. These Members are requested to send comments on the ToR's to Prof Santini not later than 31 JULY 1980.
- ahG
MEMBERS
- b. Proposals for national contributions to the Fall 1982 Specialists Meeting should be submitted at the next Meeting.

2.14 DYNAMIC RESPONSE TO DAMAGED RUNWAYS - TX.89 (SMP/SC.16)

2.14.1 Sub-Committee Report by J.J. OLSEN, Chairman

- a. The Sub-Committee met on Monday 14 April 1980 at 1230; 26 persons attended the meeting, including 12 Panel Members. The Sub-Committee agreed to hold a two-day Specialists Meeting in Spring 1982, preceded by a half-day "precursor" meeting in Spring 1981.
- b. The purpose of the short Spring 1981 meeting is to acquaint the members and a relatively small (but critical) number of technical specialists with the latest data on the runway environment for prediction and measurement of aircraft dynamic response. The Spring 1981 meeting will consist of unclassified papers from the US, GE, hopefully the NATO Military Agency for Standardization (MAS) and possibly from the UK. The national papers will deal with the actual environment; the NATO/MAS paper will deal with "standard" environments and profiles after repair. The Spring 1981 papers are not pilot papers inasmuch as they will not influence significantly the selection of the papers for the larger Specialists Meeting in Spring 1982.
- c. The Specialists Meeting in Spring 1982 will also consist only of unclassified papers and will be broken into five areas:
- 1 Runway Aspects - Runway profiles, damage profiles, repair profiles for concrete and grass sites.
 - 2 Analytical Aspects - Mathematical modeling of tyres, landing gear, airframe, secondary structures, runway stiffness; linear vs nonlinear formulations; solution techniques; sensitivity to data uncertainties; computer requirements; statistical vs. deterministic consideration.
 - 3 Testing Aspects - Taxi tests, laboratory component tests, laboratory tests for complete aircraft; the use of ground vibration test techniques and their extension to large forced excitation through the landing gear; instrumentation requirements; data handling procedures; runway profile measurements; rapid assessment by the field Commander.
 - 4 Operational Consideration - The effect on and influence of handling qualities, stability and pilot dynamics.

5. Criteria/Specifications - Recommended improvements in tyres, landing gear, structures; selection of critical load cases; recommended pilot procedures; qualification methods (analysis laboratory tests, and flight tests); recommended methods and criteria for analysts, designers, manufacturers and government certification agencies.

Tentative agreement was made on sixteen (16) papers: FR(1), GE(4), IT(2), NL(1), UK(3), US(5) with a possibility of additional papers from Portugal and/or Turkey. There is also the probability of a concluding round-table discussion.

MOLYNEUX d. Dr Molyneux and Dr Olsen will re-write the Terms of Reference and
OLSEN submit them to the SMP Executive by 1 JUNE 1980. At the Fall 1980 Meeting
ZOCHER the Members will bring exact authors and titles for the "precursor" papers
SC of the Spring 1981 Meeting. At the Spring 1981 Meeting Members will bring
MEMBERS titles and authors for the Specialists Meeting in Spring 1982.

e. The Chairman recommends consideration by the Sub-Committee on R&D Cooperation and consideration of the AGARD "Southern Flank" funds for possible use by Greece, Turkey and Portugal. These funds might possibly be used by those countries to perform research in support of our Specialists Meeting in Spring 1982.

2.14.2 Panel Discussion

a. The Panel noted and approved this Report.

2.14.3 Executive Note

a. The revised Terms of Reference referred to in para. 2.14.1d. are given in Attachment 5d.

2.15 ADVANCED CASTING TECHNOLOGY - TX 91 (SMP/SC 17)

2.15.1 Sub-Committee Report by J.R. LEE, Chairman

SC a. The Sub-Committee did not meet at this Panel Meeting and the activity
MEMBERS will start in earnest in Fall 1980. Members are reminded to come to the
Fall Meeting with firm ideas on the format of the proposed Specialists
Meeting in Spring 1982 and with first ideas of possible contributions.

2.16 MAINTENANCE IN SERVICE OF HIGH TEMPERATURE PARTS - TX.92
(SMP/SC.18)

2.16.1 Sub-Committee Report by D. LEWIS, Chairman

a. In accordance with Action 2.04.2 (49th Meeting) the University of Cincinnati has been requested to forward, to the Panel, a copy of their report on the examination of specimens supplied from the former Strain-range Partitioning cooperative programme.

b. The meeting discussed the format for the proposed Specialists Meeting to be held in Fall 1981.

SESSION I - (half-day) would be related to experiences and viewpoints from the maintenance community. Firm offers of contributions had been received:

1. Military Maintenance Policies and Procedures for High Temperature Parts - Will they be adequate? - Air Eng(32) RAF-UK
2. USAF Experience and Plans in Depot Inspection and Repair of Gas Turbine Engines - Dr Snide, University of Dayton and Major E.M. Ross, Oklahoma City Air Logistic Center.
3. Maintenance Problems in Gas Turbines (Helicopter and Marine Gas Turbines) at the Royal Navy Aircraft Yard, Fleetlands - Paper from Naval Aircraft Materials Laboratory, UK.
4. Maintenance Experience with Civil Aero Engines - KLM Royal Dutch Airlines, NL

TOVAR DE LEMOS
WALLACE

Both Portugal and Canada have agreed to explore the possibility of contributions to this Session I. The Sub-Committee felt that a contribution on problem areas and experiences from a country operating only bought-in aircraft would be of value. It was further recommended that, where possible, contributions should include case histories.

c. SESSIONS II and III (1 day, each Session of approximately equal length) would be concerned with materials R&D aspects relevant to the maintenance problems. One Session would deal in the main with retirement for cause in general and the other with rejuvenation of material after service. A number of contributions have already been promised including:

1. Criteria for Component Retirement - Rolls Royce Ltd, UK.
2. Engine Component Retirement for Cause (RFC) - Pratt and Whitney, USA.
3. Weld Repair Schemes and Associated Problems of Stress Relief.
4. Atmospheric and Hot Corrosion and Associated Protective Schemes.
5. Problems and Possibilities of Repairing and Rejuvenating Turbine Blades - Dr Huff, MTU -Germany

Papers 3 & 4 would be contributed by the firms Elbar and Chromalloy of the Netherlands.

SC MEMBERS

The possibility of a paper from Canada on hot isostatic pressing techniques was under consideration. The Sub-Committee would welcome additional contributions especially in the field of non-destructive testing (work at FIAT was referred to) and on engine sealant problems.

d. The Sub-Committee felt that, by the Fall 1980 Meeting, there would be sufficient input to enable selection of papers and authors to be made and a balanced and informative Specialists Meeting to be held. Netherlands had offered to arrange a technical visit at the Fall 1981 Meeting to either the KLM engine maintenance shop or to the Tilburg plant of the Chromalloy firm "Turbine Support Europe".

e. It is recommended that a new Chairman be appointed for this Sub-Committee to take over at the Fall 1980 Meeting. The reason for this is that the present Chairman will not be available after October 1980 and his attendance at the Fall 1980 Meeting is, at this time, uncertain.

2.16.2 Panel Discussion

a. The Panel approved the plans for the Fall 1981 Specialists Meeting and agreed that the duration of the Meeting should be extended to 2 days.

MOLYNEUX b. A new Sub-Committee Chairman was not appointed; Dr Molyneux stated that he would seek the nomination of a new UK Panel Member and for him to attend the next Meeting.

2.16.3 Interpanel Action - See para. 5.1.2.

2.17 FATIGUE RATED FASTENER SYSTEMS - TX.93 (SMP/WG.21)

2.17.1 The formation of this Working Group having been approved at the Spring 1980 NDB Meeting for commencement in Fall 1980, preliminary plans for this activity were considered at the meeting of the Critically Loaded Holes Sub-Committee. A report on these proceedings was submitted by Mr W.G. Heath, Chairman elect of the Working Group.

2.17.2 Report by W.G. HEATH, Chairman elect

a. The proposed Coordinator of this new activity, Dr H. van der Linden, NL, reviewed the Terms of Reference which had been prepared at the last Panel Meeting; revised ToR's are given in Attachment 5e. The activities leading to the first definition of the new programme were also reviewed. Each participant had submitted his country's proposed or on-going fatigue rated fastener programme and a detailed matrix had been constructed containing the variables to be evaluated. Most of the participants proposed a high load transfer test specimen. Based upon this information, detailed test matrices have been composed per specimen type.

b. A proposal for a cooperative programme was presented; this proposal is summarized below:

1. A relatively small cooperative program is proposed on "no load transfer" specimens; the results of this programme will establish a data base for comparison of the test results from two countries.
2. The Reverse Double Dogbone specimen has been accepted universally as a standard specimen for low load transfer joint testing. However, one country utilizes a deviating design. A cooperative activity has been proposed to establish the data base necessary for correlating test results obtained using both specimen designs. The work programme utilizing the standard low load transfer specimens will be adjusted to eliminate duplication and to obtain best overall coverage; no additional testing is required.

3. In the case of "high load transfer" double shear specimens, no additional testing is proposed although agreement should be reached with regard to the load levels selected. Unnecessary duplication can be prevented by adjusting the work programmes of the participants.
4. Very different "high load transfer" single shear specimens have been proposed by the participants. Since the behaviour of the fastener system depends on specimen geometry, a cooperative programme has been designed in order to generate a data base for comparison of test data obtained by different specimen designs and to develop more knowledge about the very different specimens.
5. A core programme has been defined in which each participant will test his single shear design using common test variables (one material, two fastener systems and two load levels).
6. Each participant will also test a double shear equivalent of his single shear design utilizing the same amount of load transfer; material, fastener systems and load levels should be identical to the previous phase.
7. In order to develop more knowledge about the very different specimens, measurements of secondary bending, load transfer and stiffness are necessary, combined with fractographic investigations for determination of the crack initiation site(s).

c. The Sub-Committee basically agreed to the proposed programme. Some doubt was raised on the necessity of performing tests on the double shear equivalent of the single shear specimens. However, it was felt that this part of the programme can be of great help in the correlation of single shear data. The US announced that sufficient 7050 material is available for the core programme.

d. It was noted that Sweden was prepared to participate in the cooperative programme. In order to obtain this participation it would be necessary for Dr Lars Jarfall to be accepted by the other participating nations. The Chairman was asked to draft a standard letter to be used by National Delegates signifying their acceptance of Dr Jarfall.

e. It was felt that some Southern Flank nations might wish to be involved in the proposed programme. Their interest was to be sounded during the Advisory Session on Thursday.

f. National Panel Coordinators were asked to supply names of members for the Working Group.

2.17.3 Panel Discussion

a. It was not known whether the US Coordinator for the Critically Loaded Holes programme, Mr R.B. Urzi, would be involved in the new programme. However, since only one US organization is, at present, expected to participate, the need for a US Coordinator, as such, is not apparent.

NPC's b. With reference to paras. 2.17.2d and f above, it was pointed out that National Panel Coordinators should advise their National Delegates if the appointment of non-Panel members to the Working Group is desired. National Delegates of all nations represented on the Working Group should be asked to signify their acceptance of a Swedish member whether or not a non-Panel member is appointed.

c. Director, AGARD questioned whether any consideration had been given to inclusion in the programme of NDI of the fastener installation. Mr Heath replied that some of the included work, such as examination of the fractured surfaces, was not irrelevant but, since it is not normal practice, it was not thought necessary to inspect each installation.

CARVALHINHOS
KICIMAN
SPANOS

d. The attention of the Southern Flank nations was drawn to the opportunity presented for participating in the cooperative programme and they were asked to explore the possibility of so doing as thoroughly as possible.

3. PROPOSALS FOR NEW ACTIVITIES

3.1 EFFECTS OF SHORT CRACKS - T. 94

3.1.1 ad hoc Group - H. ZOCHER, Chairman

see para. 2.03.2b.

3.2 NDT OF CERAMIC MATERIALS - T. 95

3.2.1 ad hoc Group Report by C.P. GALOTTO, Chairman

a. Twelve persons from Canada, France, Germany, Italy, UK and US attended the meeting. It was agreed that the original proposal, as given in Attachment 5f, dealing with the NDT of structural ceramic materials appeared too limited. First of all, NDT requires that the defects which one wants to detect are specified. Because they are not fully understood, implementation of NDT with proof testing has been suggested. On the other hand, the relevance of fabrication methods and quality control during fabrication to the physical and engineering properties of materials and manufacture has been pointed out. The possibility of expanding the activity to include applications other than engines (e.g. radomes) should also be considered.

BURTE
ZOCHER
GALOTTO

b. It was decided to set up an ad hoc Group which will define the limits of the activity at the next Meeting, resulting in the identification of pilot papers to be given at the Spring 1981 Meeting. The possibility of papers from Germany (Dr Förster) and from the US (Prof A.G. Evans, University of California, Berkeley) was mentioned.

3.2.2. Panel Discussion

a. The Panel approved the continuation of the activity as an ad hoc Group. The initial membership of the Group is given in page (vi).

3.3 CAD/CAM

3.3.1 Informal Group Report by R.J. MEYER-JENS, Chairman

a. The informal Group met for one hour to discuss the possibility of any further action by the Panel in the field of "CAD/CAM". There were nine individuals taking part in the discussion, seven of them being Panel Members. As a basis of the discussion, the Chairman repeated the outcome of the SMP Specialists Meeting on "CAD in the Production Design Office" which was that the aim should be to reach a higher degree of commonality by:

1. Common development of a specification for a realistic 3-D system related to users' requirements.
2. Common development of an interface specification to allow data transfer between design offices of different companies/nations.

3. Common development of a specification for design-specific data bases.

- b. At that time it was decided to take no action before the FMP Specialists Meeting on CAD had taken place. The Proceedings of this Meeting, in which Mr D. Weinbauer, GE took part on behalf of SMP, are now available. From the Proceedings and from Mr Weinbauer's report, it may be concluded that there is practically no interference between the work of the two Panels, and thus the SMP is free to decide.
- c. From the discussion on this basis it follows that:
 - 1. No specific action can be proposed at the moment.
 - 2. The Group is in doubt, whether or not AGARD is the right forum to take any action with respect to the three possibilities mentioned above as the outcome of our Specialists Meeting. The question was raised as to whether these topics would not be more appropriate for AECMA. The Group felt that this question should be discussed and decided by the Panel as a whole. If AGARD-SMP is thought to be the right forum, the Group is willing to have further discussions during the next Meeting.
- d. Another possibility might be, perhaps as a final step, to come to a common definition of the term "design" with the advice of experts from different companies/nations. The discussions in our Panel, as well as the discussion during the FMP Specialists Meeting, have shown that the term "design" is used for quite different things (e.g. general layout of an a/c, of systems, aerodynamic design). Dr Olsen made the point that quite recently several US companies have tried to come to a common definition of "design". Dr Olsen offered to try to get one of the participants of that activity to report before our Panel, if wanted.

3.3.2 Panel Discussion

- a. The Panel felt that there was no urgent need to undertake any activity in this area and agreed that it should be reconsidered at a later date.

4. TECHNICAL PROGRAMME

4.1 STATUS OF WORKING ACTIVITIES

4.1.1 Terminated Activities

- a. One Working Group was terminated, subject to the approval of the NDB:
"Standard Aeroelastic Configurations" - TX.84 (SMP/WG.19)
- see para. 2.10.
- b. One Sub-Committee was terminated:
"Critically Loaded Hole Technology" - TX.73 (SMP/SC.05)
- see para. 2.05.
- c. One ad hoc Group was terminated:
"Fracture Mechanics Design Methodology" - T. 64
- see para. 2.03.

4.1.2 Current Activities

- a. One existing ad hoc Group continues with a change in title:
"Dimensionally Stable Structures for Space" - T. 88 becomes
"Materials for Space Applications" - T. 88 - see para. 2.13.

4.1.3 New Activities

- a. One new Working Group was approved by the NDB in March 1980 and will formally convene at the next Meeting:
"Fatigue Rated Fastener Systems" - TX.93 (SMP/WG.21)
- b. Two new ad hoc Groups were formed:
"Effects of Short Cracks" - T. 94 - see para. 3.1.
"NDT of Ceramic Materials" - T. 95 - see para. 3.2.

4.2 CONTENT OF PROGRAMME

4.2.1 Specialists Meetings

a. The schedule of proposed Specialists Meetings, as now approved by the Panel, is given in Attachment 6.. Changes relative to that published in the 49th Summary Record are as follows:

SPRING and FALL 1981 - Minor changes in titles and durations

SPRING 1982 - Addition of second Meeting entitled:
"Dynamic Response to Damaged and Repaired Runways"

FALL 1982 - Major change in title of first Meeting to:
"Environmental Effects on Materials for Space
Applications"
Addition of second Meeting entitled:
"Effects of Short Cracks on Aeronautical Components"

SPRING 1983 - Provisional selection of Meeting on:
"Characterization and Significance of Damage in
Composite Materials"

b. The dates suggested for the 1982 Meetings take account of religious holidays on 9 and 12 April, and on the probability that the AGARD Annual Meeting will be held in the USA on 14-16 September.

4.2.2 Meeting Locations

PANEL
MEMBERS

a. The Fall 1980 Panel Meeting will be held at the Palais des Congrès, Aix-en-Provence, France as previously reported. Hotel reservations should be made through the Tourist Office, Aix, on the forms already distributed, not later than 30 JUNE 1980, if specified accommodation is to be assured. The Tourist Office will assist, as far as possible, up to 31 JULY to find some accommodation.

b. It is confirmed that the 1981 Meetings will be in Turkey and the Netherlands respectively. The Spring Meeting will be at the Altin Yunus (Golden Dolphin), Çeşme which is a resort hotel on the coast about 80 km from Izmir. The Fall Meeting will be at the Leeuwenhorst Congresscenter, Noordwijkerhout as previously reported.

c. The Panel recommended that the 1982 Meetings should be held in Belgium and Canada respectively, subject to an invitation being received from Belgium. Canada has already sent an invitation for the Fall Meeting, possibly in Toronto.

d. Proposals for 1983 are Portugal and the UK, in that order.

4.2.3 Workload and Balance

a. There will be a total of 15 working activities in existence at the next Meeting, of which 12 are fully defined with Terms of Reference approved by the Panel. The total is the same as at the current Meeting and represents a satisfactory workload. Two new activities could be accepted for starting in Fall 1980.

b. The present status and predicted course of all current activities is shown diagrammatically in Attachment 7. The balance of the programme as between Structures and Materials aspects shows a good balance and it is noted that two of the new activities form strong links between the two areas.

EXEC

c. The total demand for time at the next Meeting is quite light, comparable to the current Meeting. The Executive will prepare a draft schedule in the near future and distribute this to Panel Members for comment.

4.3 PROGRAMME DETAILS AND EXPENDITURE

4.3.1 1979 Programme

a. The final total expenditure for 1979 amounted to FF 175200, rather higher than previously estimated, largely due to the high cost of the Conference Proceedings of the "Ceramics" Meeting which contains a large number of half-tone illustrations. It also includes funds committed in 1979 for a contract for editing Vol. I of the Corrosion Handbook but which was ultimately rejected by the proposed editor.

b. Several publications available for printing at the end of the year were deferred until January 1980 due to shortage of AGARD funds. The estimated cost of these amounts to FF 157000; thus the total expenditure on the planned programme would have been about FF 332000 compared with the budget provision of FF 323000.

4.3.2 1980 Programme

a. The complete Technical Programme for 1980, and subsequent years, as updated at the current Meeting, is shown in Attachment 8. With the transfer of some publications from the 1979 Programme, it is estimated that the total funds required will be about FF 408000 compared with an original budget provision of FF 305000.

b. Budgets of all Panels have now been reviewed and it has proved possible to increase the SMP to FF 350200. However, there is still an estimated shortage of funds amounting to about FF 50000 which may mean that, again, some end-of-year publications may have to be deferred.

4.3.3 1981 Programme

a. The 1981 Programme and budget, as approved by the NDB in March 1980, is given in Attachment 8. The total funds approved, FF 301600, are somewhat less than requested but it is too early to predict the implications of this.

4.3.4 1982 Programme

a. Such details of the 1982 Programme as have so far been defined are also given in Attachment 8.

4.4 LECTURE SERIES

4.4.1 Lecture Series No 106

This Lecture Series on "Materials Coating Techniques", directed by Mr Dennis Teer, University of Salford, UK was presented in Lisbon, Athens and Ankara during the period 27 March- 4 April 1980. It was well presented and received, with a total attendance of about 180.

4.4.2 Lecture Series No 118

This Lecture Series on "Fatigue Test Methodology", proposed by Mr J.B. de Jonge, will be directed by Dr P.R. Edwards, RAE, UK. It will be presented in Denmark, Portugal and Greece during the period 19-28 October 1981.

4.4.3 Lecture Series 1982

PANEL
MEMBERS

Proposals or recommendations are required for Lecture Series, to be sponsored by SMP, for presentation in 1982. These should be submitted at the next Meeting, taking account of the proposals previously received, as given in Attachment 12 of the 49th Summary Record. Proposals should include a description of the proposed scope and recommendations for Lecture Series Director and Locations.

4.4.4 Special Course

A Special Course on "Data Analysis Techniques in Noise and Vibration", sponsored jointly by FDP and SMP, will be presented at VKI in 1981.

4.5 CONSULTANT AND EXCHANGE PROGRAMME

a. Only one consultant mission in the structures and materials area has, so far, been arranged for this year. This is for Prof B. Harris, University of Bath, UK to visit Det Norske Veritas, Norway in June to give advice on non-destructive testing of glass-fibre reinforced plastics.

b. Negotiations are in progress for a consultant, possibly Mr W. Barrois, to visit AERITALIA to give lectures and technical advice on fatigue quality index and stress severity factor analysis and application

c. Initial steps have been taken to meet Greek requests for consultant missions on the fatigue life of fighter aircraft and on aircraft structural modification design.

5. INTERPANEL AND INTERAGENCY ACTIVITIES

PANEL MEMBERS

The items below summarize those areas where there is a requirement for coordination or exchange of information with the activities of other Panels. SMP Members may obtain further information and copies of the relevant publications of other Panels on request to the SMP Executive, prior to publication.

5.1 STRUCTURES AND MATERIALS PANEL

5.1.1 Coordination

Coord. with

a. Publication

"Aeroelasticity for Turbomachinery" AGARDograph
- see para. 2.01.

PEP

b. Special Course

"Data Analysis Techniques in Noise and Vibration"
to be co-sponsored in 1981 at VKI
- see para. 4.4.4.

FDP

5.1.2 Information

a. Specialists Meetings

Spring 1980 - "Composite Materials"

FMP, PEP
AVP (selective)
FMP (selective)
FDP

Fall 1980 - "Helicopter Fatigue Life Assessment"
"Boundary Layer Effects"

Spring 1981 "Aircraft Corrosion"
"Corrosion Fatigue"

PEP

Fall 1981 "Maintenance in Service of High
Temperature Parts"
"Dynamic Environmental Qualification
Techniques"

PEP

AVP, FMP, FDP

b. Working Activities

"Aeroelasticity" - TX 47

FDP, FMP

"Impact Damage Tolerance" - T. 63

FDP

"Factors of Safety" - TX 77

FMP

"R&D Cooperation" - TX 82

ALL

"Helicopter Fatigue" - TX 86

FMP

"Dynamic Response to Damaged Runways" - TX 89

PEP

5.2 AVIONICS PANEL

5.2.1 Coordination

a. Technical Meetings

Spring 1980 - "Electromagnetic Effects of Carbon Composite Materials
upon Avionics Systems" Specialists Meeting

Mr Jubé, FR will present a paper on the conclusions of the Spring 1980
SMP Specialists Meeting

5.2.2 Information

a. Lecture Series

"Atmospheric Electricity/Aircraft Interaction", LS 110, 1980.

5.3 FLIGHT MECHANICS PANEL

5.3.1 Coordination

a. Technical Meetings

"The Influence of Unsteady Aerodynamics on Aircraft Behaviour"
Dr G. Coupry, FR is acting as SMP liaison for a Symposium tentatively planned for 1982.

5.3.2 Information

a. Technical Meetings

Spring 1981 - "The Impact of Military Applications on Rotorcraft and V/STOL Aircraft Design".

5.4 FLUID DYNAMICS PANEL

5.4.1 Information

a. Technical Meetings

Spring 1980 - "Subsonic/Transonic Configuration Aerodynamics" Symposium

Fall 1980 - "Computation of Viscous-Inviscid Interactions" Symposium

b. Publications

"A Compilation of Unsteady Turbulent Boundary Layer Data"
- AGARDograph, Fall 1980

"Transonic Computational Fluid Dynamics"
- AGARDograph, Spring 1981

c. Special Course

"Unsteady Aerodynamics" - 1980

5.5 PROPULSION AND ENERGETICS PANEL

5.5.1 Coordination

a. Publication

"Flutter in Turbomachinery" - AGARDograph, see para. 2.01.

5.6 NATO ACTIVITIES

5.6.1 Science Committee

a. The Special Programme Panel on Materials Science held a meeting at NATO Headquarters on 23-24 April 1980. Several potential activities of interest to SMP were discussed; details will be distributed to SMP Members when received at AGARD.

b. The next meeting will be held on 23-24 October 1980, also at NATO, and SMP are invited to send a representative.

6. EDITORIAL COMMITTEE

The Committee did not convene at the current Meeting. The only task since the last Meeting has been to review AGARDograph No 257 "Practical Applications of Fracture Mechanics" prior to publication. This work has now been completed.

7. PANEL BUSINESS MATTERS

This Section reports on those items of business that have not been covered in previous Sections.

7.1 PERSONNEL

7.1.1 Panel Officers

There were no changes in the appointments of Panel Officers at the current Meeting.

7.1.2 Panel Membership

a. The following Members have retired, or are understood to be retiring shortly:

Ing. General M. El Gammal, FR	-	as from 31 December 1979
Prof Dr-Ing W. Bunk, GE	-	" " "
Prof Papamantelos, GR	-	" " "
Dr E. Bolis, IT	-	" " "
Mr M.H. Güler, TU	-	" " "
Wg Cdr B. Robson, UK	-	" 16 June 1980

b. The following new Members have been appointed:

Mr P. Costa, FR	-	as from 1 January 1980
Dr-Ing G. Grüninger, GE	-	" " "
Major N. Liakos, GR	-	" " "
Dr E.S. Wright, US	-	" " "
Prof Ing E. Vallerani, IT	-	" 2 April 1980
Wg Cdr D.M.F. Bright, UK	-	" 17 June 1980

c. The total Panel membership is, at present, 59.

7.2 NATIONAL DELEGATES BOARD MEETING, SPRING 1980

7.2.1 Programme

a. The Meeting was held in Paris, France on 19-21 March 1980 and consisted of the usual Panel Chairmen Meeting, Steering Committee Meeting and Open and Executive Sessions of the National Delegates Board.

7.2.2 Panel Chairmen Meeting - Chairman: M. l'Ing. J.F. RENAUDIE, FR - FMP

- a. The question of a limitation on the distribution of AGARD documents had not been fully discussed by all Panels but none were in favour of any change in the present arrangements.
- b. The Panel Chairmen were unanimously convinced that the present of Executives at AGARD Annual Meetings in the Fall is indispensable to interpanel coordination activities, particularly after the unfortunate experience of the Fall 1979 Meeting - see para. 7.2.3a.
- c. Satisfaction was expressed in the measures taken to improve the flow of information between NATO Headquarters and AGARD, with the appointment of an Executive for External Relations.
- d. The Panel Chairmen supported the AGARD Headquarters initiative for the establishment of Collaborative Research Programmes, which should be incorporated as far as possible as separately funded additions to existing Panel Programmes - see para. 7.2.3c.

7.2.3 National Delegates Board

- a. The Board reversed its previous decision and agreed that Executives should, in future, attend AGARD Fall Annual Meetings.
- b. Panel Chairmen submitted their Panel programmes for 1981. The SMP programme, including the new Working Group on "Fatigue Rated Fastener Systems", was approved with no discussion.
- c. The Board recommended that additional funds for the support of Collaborative Research Programmes should be included in the AGARD 1981 budget. These funds, amounting to FF 500000, should be used only for programmes in which either Greece, Portugal or Turkey would participate.
- d. AASC Study No 13, to start in May 1980, will be on the possibilities of the reduction of radar, infra-red, noise and other signatures, including the penalties in performance and cost. The following topics will be reviewed prior to selection of a study to begin January 1981:
 - STOVL, High Altitude RPV's, Man in the Cockpit.
- e. The Chairman of the Military Agency for Standardization solicited comments from the Panels on areas where standardization documents could improve cooperation in NATO. Recommendations should be integrated through AGARD.
- f. A design was selected for the AGARD Tie. Orders may now be placed.

7.3 OTHER BUSINESS ITEMS

7.3.1 Advisory Session

a. The Advisory Session, held on Thursday 17 April, was considered to be very profitable and should be repeated at all future Meetings. However, these Sessions would be of even greater value if Panel Members could be advised, in advance, of the topics to be discussed. Selection of topics should not be restricted to the host nation; requests from the Southern Flank nations would be particularly welcome.

NPC's

EXEC

b. It was agreed that National Panel Coordinators should provide information on the topics they wish to be discussed to the Executive not later than 15 JULY 1980. The Executive will then distribute this information to Panel Members.

7.3.2 Working Groups

a. Director, AGARD advised the Panel that he had been requested by the NDB to produce a report on the progress of Working Groups for the NDB Spring Meeting. Reports would be required from Panels after their Fall Meetings.

7.3.3 Large Scale Computers

a. The Panel had been requested to comment on an FDP proposal to establish a multi-Panel Working Group on "The Use of Large Scale Computing in Aeronautics". The Panel considered that they could make a useful contribution though it was pointed out that shared use of a very large computer is largely a software problem.

7.3.4 Organization and Procedures

a. The revised draft of the Panel Organization and Procedures document, dated January 1980, was approved and adopted. In reply to a question of interpretation of the Panel Terms of Reference, Director, AGARD commented that, though AGARD is part of the NATO military structure, there was no objection to dealing with civil matters to a reasonable degree.

STRUCTURES AND MATERIALS PANEL

Programme of the 50th Meeting
Specialists Meeting on
EFFECT OF SERVICE ENVIRONMENT ON COMPOSITE MATERIALS

THEME

This Meeting will bring together people working on the environmental resistance of composites, for structural use in airframe or engine components, in order to exchange views on test procedures, material characterization, methods of detecting environmental degradation, understanding the physical and chemical behaviour of products and the level of admissible degradation or defects. The objectives are to reduce the range of uncertainty now associated with composites and to improve the confidence of users in the weight savings to be obtained.

Meeting Chairman
Mr Georges JUBE
Aérospatiale, Paris - France

MONDAY 14 APRIL

INTRODUCTION - Meeting Chairman

SESSION I - PHYSICO-CHEMICAL EFFECTS OF ENVIRONMENT

Chairman
Dr R M CARLSON
Ames Research Center
Moffett Field, CA 94035 - USA

Recorder
Dr M.F. CARD
NASA Langley Research Center
Hampton, VA 23665 - USA

"The Implications of Laboratory Accelerated
Conditioning of Carbon Fibre Composites"
by E C EDGE
British Aerospace, Military Aircraft Division
Preston, Lancs - UK

"Effect of Various Environmental Conditions
on Polymer Matrix Composites"
by Dr R.C. TENNYSON
Institute for Aerospace Studies, Downsview, Ont - Canada

"Predictability of Moisture Absorption in
Graphite/Epoxy Sandwich Panels"
by Dr H.W. BERGMANN and P. NITSCH
DFVLR, Braunschweig - Germany

"Effects Connected with the Space Environment
on Composite Materials"
by Prof R. BARBONI and Dr I. PERONI
Istituto di Tecnologia Aerospaziale, Roma - Italy

TUESDAY 15 APRIL

SESSION II - ENVIRONMENT SUPERIMPOSED ON STRESSING

Chairman
John R. LEE
Westland Helicopters
Yeovil, Somerset - UK

Recorder
Dr G. DOREY
RAE - Materials Dept
Farnborough, Hants - UK

"Constant Amplitude and Flight-by-Flight
Tests on CFRP Specimen"
Dr K.O. SIPPEL and F.J. ARENDTS
MBB GmbH/UF, München - Germany

"Fatigue Strength of CFRP under Combined Flight-by-Flight
Loading and Flight-by-Flight Temperature Changes"
by J.J. GERHARZ and Dr Dieter SCHÜTZ
LBF, Darmstadt - Germany

"Fatigue Test Results of Carbon Fibre Reinforced Plastics
F-28 Aircraft Component and its Structural Details"
by Ir J.A.A.M. DIJNS
Fokker VFW B.V., Schiphol-Oost - Netherlands

"Effects of Temperature and Moisture on the Creep
Compliance of Graphite-Epoxy Composites"
by Dr K.G. KIBLER
General Dynamics, Fort Worth - TX - USA

SESSION III - MECHANICAL EFFECTS AND HAZARDS

Chairman
Dipl Ing H. ZOCHER
IABG mbH, Ottobrunn - Germany

Recorder
Dipl Ing K. BRUNSCH
MBB GmbH/UD, München - Germany

"Relationships between Impact Resistance and Fracture
Toughness in Advanced Composite Materials"
by Dr G. DOREY
RAE, Materials Dept, Farnborough, Hants - UK

"Erosion et impacts sur les Pales d'Hélicoptères
en Composites"
by M. TORRES
Aérospatiale, Div. Hélicoptères, Marignane - France

"Graphite-Epoxy Panel Compression Strength
Reduction due to Local Impact"
by Dr M.F. CARD and M.D. RHODES
NASA-Langley Research Center, Hampton, VA - USA

"The influence of Defects on the Behaviour of Composites"
by R. AOKI and K. STELLBRINK
DFVLR, Stuttgart - Germany

WEDNESDAY 16 APRIL

SESSION IV - PHYSICAL HAZARDS

Chairman
Lt-Col S. SIGNORETTI
Ministero della Difesa
Roma - Italy

Recorder
Prof R. BARBONI
Istituto di Tecnologia Aerospaziale
Roma - Italy

"Evaluation du Comportement à la Foudre de Structures
en Matériaux Composites Haut Module"
by J. ROUCHON & D. GALL
CEAT, Toulouse - France

"Lightning Protection Considerations for
Graphite-Epoxy Aircraft Structure"
by S. D. SCHNEIDER
The Boeing Co, Seattle, WA - USA

"The Potential for Damage from the Accidental Release
of Conductive Carbon Fibers from Aircraft Composites"
by Dr V. L. BELL
NASA-Langley Research Center, Hampton, VA - USA

"Erosion of Composite Materials"
by Prof G. S. SPRINGER
MIT, Cambridge, MA - USA

SESSION V - CASE STUDIES OF SERVICE EXPERIENCE

Chairman
J. AUVINET
Service Technique Aeronautique, Paris - France

Recorder
J. M. FEHRENBACH
CEAT, Toulouse - France

"Fatigue and Damage Propagation in Composite Rotor Blades"
by Dr A. J. BARNARD
Westland Helicopters Ltd, Yeovil, Somerset - UK

"Service Experience with GRC Helicopter Blades (BO-105)"
by K. BRUNSCH, MBB GmbH/UD, München - Germany

"Composite Components on Commercial Aircraft"
by H. Benson DEXTER
NASA-Langley Research Center, Hampton, VA - USA

"Air Force Applications and In-Service Experience
with Composite Structures"
by F. J. FECHER
AF Wright Aeronautical Labs, WPAFB, OH - USA

"US Navy Service Experience with Advanced Composites"
by Dr A. R. SOMOROFF, M. DUBBERLY, J. M. MCGINN & M. TARRICONE
Naval Air Systems Cdr, Washington, DC - USA
& A. MANNO, Naval Air Development Ctr, Warminster, PA - USA

THURSDAY 17 APRIL

SESSION VI - FINAL DISCUSSION AND RESUME

Chairman: Mr G. JUBÉ, Aérospatiale, Paris - France

PRESENTATIONS TO WORKING ACTIVITIES

WEDNESDAY 16 APRIL

AEROELASTICITY Sub-Committee

Chairman: Dr G. COUPRY, ONERA - France

"Effects of Non-Linearities on Wing-Store Flutter"

by G. DE FERRARI and L. CHESTA

AERITALIA, Torino - Italy

and

O. SENSBURG and A. LOTZE

MBB GmbH/UF, München - Germany

"Optimization of the Mathematical Model of a Structure"

by H. ZIMMERMANN

VFW-Fokker GmbH, Bremen - Germany

**"Comparaison des Champs de Pression Instationnaires
Calculés et Mesurés sur le Modèle ZKP"**

by M. COUSTON, J.J. ANGELINI & J.L. MEURZEC

ONERA, Chatillon - France

**"Wind Tunnel Test of the Improved YF-17 Wing-Store Flutter
Suppression System - An International Effort"**

by Dr C. HWANG, E.H. JOHNSON & G.R. MILLS

Northrop Corp. A/C Div. Hawthorne, CA - USA

and

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L CASALEGNO (O) Composites	AERITALIA Corso Marche 41 - 10146 Torino
Lorenzo CHESTA (A) Aeroelasticity	AERITALIA, Gruppo Velivoli da Combattimento Corso Marche, 41 - 10146 Torino
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Gianfranco DE FERRARI (A) Aeroelasticity	AERITALIA, Gruppo Velivoli da Combattimento Corso Marche, 41 - 10146 Torino
S MIGNOSI (O) Composites	AERITALIA Via Privata, Pomigliano d'Arco - 80038 Napoli
F MUSSI (O) Composites	Costruzioni Aeronautiche G. AGUSTA SpA 21017 Cascina Costa, Samarate (Varese)
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P ROCCARO (O) Composites	SIAI-MARCHETTI SpA Direzione Tecnica Via Indipendenza, 2 - 21018 Sesto Calende (Varese)
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Ir J.B. de JONGE Panel Chairman	National Aerospace Laboratory-NLR P O Box 153 - 8300 AD Emmeloord
Dr H.P. van LEEUWEN Panel Member	NLR - 8300 AD Emmeloord
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Ir Th LEEMAN (O) Composites	Civil Aviation Department P.O. Box 7555 - 1117 ZH Schiphol-Oost
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Ir P. MINDERHOUD (O) Composites	Fokker-VFW BV P.O. Box 7600 - 1117 ZJ Schiphol-Oost
Ir D. SLAGER (O) Composites	Fokker-VFW BV P.O. Box 7600 - 1117 ZJ Schiphol-Oost
Ir C. J. VERNOOIJ (O) Composites	Fokker-VFW BV P.O. Box 7600 - 1117 ZJ Schiphol-Oost
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Dag SLOTFELDT-ELLINGSEN (O) Composites	Central Institute for Industrial Research Blindern - Oslo 3
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COUNTRY - NAME/TITLE/FUNCTION

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Av. Rovisco Pais - 1000 Lisbon

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Assoc. Professor A. YEGINOBALI
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Vice-President, ODTÜ
Middle East Technical University - Ankara

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Head of Fatigue Section, Aerospace Division
SAAB-SCANIA AB - S-58 188 Linköping, Sweden

Dr Börje ÖSTMAN
(O) Composites

Head, Materials Res Div Swedish National
Defence Research Institute (FOA), FOA 2
S-104 50 Stockholm, Sweden

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WELCOMING ADDRESS:

Major General A ACHTIDAS
Technical Inspector, HAF General Staff
Hoflorgos, Athens
National Delegate to AGARD

HOST COORDINATORS

Colonel A SPANOS, Commander, KETA
Major N LIAKOS, KETA
Panel Members

Lt Colonel Minas IOSIFIDES, HAFGS
National Coordinator to AGARD

AGARD STAFF

Mr Jack BURNHAM, Director
Colonel P A PRYOR, US Army, Chief, MCS Division

SMP 51st Meeting, Fall 1980
Specialists Meeting on
HELICOPTER FATIGUE LIFE ASSESSMENT

THEME

The major objective of this Meeting is to take a further step towards the collection of experience on the fatigue evaluation and substantiation of new helicopters. The Meeting will include surveys of current procedures and service experience, consideration of new concepts associated with the introduction of new technologies such as composite materials, new philosophies relevant to service damage and combat damage, and a review of testing techniques and methodologies for airframes and dynamic components. Finally, presentations will be made on a European exercise aimed at the development of standardized fatigue load histories for helicopter rotors.

Meeting Chairman

Ingenieur en Chef de l'Armement J.M. FEHRENBACH
Sous-Directeur Technique
Centre d'Essais Aeronautique de Toulouse
23 ave H. Guillaumet
31056 Toulouse Cedex - France

MONDAY 15 SEPTEMBER

BRIEFING	- (Chairmen, Rapporteurs, Authors, Interpreters and Technicians only)	1400		
INTRODUCTION	- Meeting Chairman	1430		
<u>SESSION I</u>	- SURVEY OF CURRENT PROCEDURES			
<table><tr><td><u>Chairman</u> Ir J.B. de JONGE National Aerospace Laboratory-NLR P.O. Box 153 8300 AD Emmeloord, Netherlands</td><td><u>Rapporteur</u> Dr-Ing Walter SCHÜTZ IABG mbH - Abt TFB Einsteinstrasse 20 8012 Ottobrunn, Germany</td></tr></table>			<u>Chairman</u> Ir J.B. de JONGE National Aerospace Laboratory-NLR P.O. Box 153 8300 AD Emmeloord, Netherlands	<u>Rapporteur</u> Dr-Ing Walter SCHÜTZ IABG mbH - Abt TFB Einsteinstrasse 20 8012 Ottobrunn, Germany
<u>Chairman</u> Ir J.B. de JONGE National Aerospace Laboratory-NLR P.O. Box 153 8300 AD Emmeloord, Netherlands	<u>Rapporteur</u> Dr-Ing Walter SCHÜTZ IABG mbH - Abt TFB Einsteinstrasse 20 8012 Ottobrunn, Germany			
"State-of-the-Art and Statistical Aspects of Helicopter Fatigue Substantiation Procedures" by Ir R. NOBACK NLR- 8300 AD Emmeloord, Netherlands		1440		
"Fatigue Assessment of UK Military Aeroplanes" by J.I.M. FORSYTH RAE-Structures Department Farnborough, Hants GU14 6TD - UK		1500		
"Synopsis of Specialists Meeting on Helicopter Fatigue Methodology" by D.C. BORGMAN, Director of Advanced Systems & D.P. SCHRAGE, Directorate for Development & Qualification US Army Aviation R&D Command (AVRADCOM) St-Louis, MO 63166 - USA		1520		
GENERAL DISCUSSION	- SESSION I	1540		
BREAK		1610		

MONDAY 15 SEPTEMBER (Cont'd)

SESSION II - NEW CONCEPTS/DAMAGE TOLERANCE

Chairman
Dipl Ing H. ZOCHER
IABG mbH - Abt IF
Einsteinstrasse 20
8012 Ottobrunn, Germany

Rapporteur
Dipl Ing K. BRUNSCH
MBB GmbH/UD
Postfach 80 11 40
8000 München 80, Germany

- "Application of Damage Tolerance Concepts
for MBB Helicopters" 1630
by M. v. TAPAVICZA and F. OCH
Messerschmitt-Bölkow-Blohm GmbH
Postfach 80 11 40
8000 München 80 - Germany
- "Damage Tolerance Concepts for Composite
Parts of Aerospatiale Helicopters" 1650
by G. STIEVENARD
Aerospatiale, Division Hélicoptères
B.P. 13
13722 Marignane - France
- "Combat Damage Assessments" 1710
by C.H. CARPER, Jr.
Chief, Safety & Survivability Area
Applied Technology Laboratory
US Army Research & Technology Laboratories
(AVRADCOM)
Fort Eustis, VA 23604 - USA
- GENERAL DISCUSSION - SESSION II 1730
- ADJOURN 1800

TUESDAY 16 SEPTEMBER

SESSION III - SURVEY OF SERVICE EXPERIENCE WITH
REGARD TO EXISTING PROCEDURES

Chairman
J. R. LEE
Deputy Chief Designer
Westland Helicopters Ltd
Yeovil, Somerset BA20 2YB - UK

Rapporteur
J. DARTS
Royal Aircraft Establishment
Structures Department
Farnborough, Hants GU14 6TD - UK

- "An Evaluation of Fatigue Procedures for
UK Military Helicopters" 0900
by R. CANSDALE
Royal Aircraft Establishment
Structures Department
Farnborough, Hants GU14 6TD - UK
- "Helicopter Fatigue - A Civil View" 0920
by H. E. LESUEUR
Civil Aviation Authority, Airworthiness Division
Brabazon House
Redhill, Surrey RU1 1SQ - UK

TUESDAY 16 SEPTEMBER (Cont'd)

"Fatigue and Component Life: What it means
to the Commercial Operator" 0940

by A B STEWART and E van SCHAIK
Schreiner Airways B.V.
Kenzerstraat 2
2584 BH The Hague - Netherlands

"Helicopter Component Fatigue Life Determination" 1010

by M J McGUIGAN, Manager of Structures Technology
& M E GLASS, Chief of Dynamic Structures
Bell Helicopter Textron
P O Box 482
Fort Worth, TX 76101 - USA

GENERAL DISCUSSION - SESSION III 1020

BREAK 1050

SESSION IV - TESTING TECHNIQUES AND METHODOLOGY

Chairman

Dr R M CARLSON
Director, US Army R&T Labs
(AVRADCOM) Attn: DAVDL-D
Ames Research Center
Moffett Field, CA 94035 - USA

Rapporteur

Dean C. BORGMAN
Director of Advanced Systems
US Army Aviation R&D Command
(AVRADCOM)
St-Louis, MO 63166 - USA

"Fatigue Testing of SA 341 Gazelle Airframe" 1110

by Mr PETIARD
Aérospatiale, Division Hélicoptères
B P 13
3722 Marignane - France

and

Mr LAMBERT
Chef du Laboratoire d'Essais de
Fatigue des Structures - CEAT
23 ave Henri Guillaumet
31056 Toulouse Cedex - France

"Helicopter Gearbox Substantiation: The Function
of Overstress Testing" 1130

by Robert ZINCONE
Vice-President Engineering
Sukcesky Aircraft Division
North Main Street
Stratford, CT 06602 - USA

LUNCH BREAK 1150

TUESDAY 16 SEPTEMBER (Cont'd)

"Fatigue Testing of Helicopter Gearboxes" 1350
by A H. BAKER
Assistant Chief Development Engineer
Westland Helicopters Ltd
Yeovil, Somerset BA20 2YB - UK

"The Methodology Applied to Fatigue Analysis and 1410
Testing of the Main Rotor Blade and Hub of the
YAH-64 Advanced Attack Helicopter"
by J.M. McDERMOTT
Manager, Structures Analysis Group
Technology Department MS T-209A
Hughes Helicopters
2560 Walnut Ave
Venice, CA 90501 - USA

"Fatigue Testing of Composite Rotor Blades" 1430
by Dipl Ing F OCH
MBB GmbH
Postfach 80 11 40
8000 München 80 - Germany

GENERAL DISCUSSION - SESSION IV 1450

BREAK 1520

SESSION V - CONSTANT AMPLITUDE/SPECTRUM LOADING

Chairman
Professor A. SALVETTI
Istituto di Aeronautica
Facoltà d'Ingegneria
via Diotisalvi, 2
56100 Pisa - Italy

Rapporteur
P. ALLI
Costruzioni Aeronautiche
G. AGUSTA SpA
21017 Cascina Costa
Samarate (Va) - Italy

"Development of Standardized Fatigue Test
Load Histories for Helicopter Rotors"

- "Basic Considerations" 1540
by J. DARTS
RAE, Structures Department
Farnborough, Hants GU14 6TD - UK
and
Dr-Ing Dieter SCHÜTZ
Laboratorium für Betriebsfestigkeit
Bartningstrasse 47
6100 Darmstadt Kranichstein - Germany

- "Derivation and Definition of HELIX/FELIX" 1600
by Dr-Ing Walter SCHÜTZ and Dipl Ing M. HÜCK
IABG mbH
Einsteinstrasse 20
8012 Ottobrunn - Germany

TUESDAY 16 SEPTEMBER (Cont'd)

"Fatigue Test Programme and Test Results" 1620
by Dr-Ing Dieter SCHÜTZ and Dipl Ing H.G. KÖBLER
Laboratorium für Betriebsfestigkeit
6100 Darmstadt-Kranichstein - Germany

and
Ir J.B. de JONGE
NLR - P.O. Box 153
8300 AD Emmeloord - Netherlands

"Fatigue Behaviour of Helicopter Dynamic Components 1640
under Constant Amplitude and Spectrum Loading"

by Dr G. CAVALLINI and Dr A. LANCIOTTI
Istituto di Aeronautica
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Via Diotisalvi, 2
56100 Pisa - Italy

and
G. ALDINIO and R. ROVELLOTTI
Costruzioni Aeronautiche G. AGUSTA SpA
21017 Cascina Costa-Samarate (Va) - Italy

GENERAL DISCUSSION - SESSION V 1700

ADJOURN 1730

WEDNESDAY 17 SEPTEMBER

SESSION VI - ROUND TABLE DISCUSSION

Chairman : ICA J.M. FEHRENBACH
Sous-Directeur Technique, CEAT
31056 Toulouse Cedex - France

Rapporteur : Ingenieur de l'Armement G. BRETECHER
Service Technique des Programmes Aéronautiques
Département Hélicoptères
4 ave de la Porte d'Issy
75996 Paris Armées - France

Summaries of Rapporteurs 0900

GENERAL DISCUSSION 0950

BREAK 1030

GENERAL DISCUSSION (Cont'd) 1050

ADJOURN 1150

SMP 51st Meeting, Fall 1980
Specialists Meeting on
BOUNDARY LAYER EFFECTS ON UNSTEADY AIRLOADS

THEME

The Meeting will present a survey of recent progress in the theoretical and experimental analysis of unsteady behaviour of the boundary layer. These improvements will be presented as possible future tools for the introduction of viscous effects in classical aeroelastic applications. Some papers will also deal with actual means for coupling inviscid and viscous flow, and for deriving relatively simple models.

Meeting Chairman

Dr G. COUPRY

Directeur Scientifique de la
Resistance des Structures
ONERA, 92320 Chatillon - France

WEDNESDAY 17 SEPTEMBER

BRIEFING - (Chairmen, Authors, Interpreters 1330
and Technicians only)

INTRODUCTION - Meeting Chairman 1400

SESSION 1 - PREDICTION METHODS AND COMPARISON
WITH EXPERIMENTS - Part 1

Chairman

Dipl Phys H ZIMMERMANN
VFW-ORKK: GmbH Ek 42
Postfach 10 78 45
2800 Bremen 1 - Germany

Recorder

D.G. MABEY
Royal Aircraft Establishment
Dynamics Laboratory
Bedford MK41 6AE - UK

"An Assessment of Theoretical Models for
Transonic and Viscous Flow" 1410

by Prof E.H. DOWELL and Dr M.H. WILLIAMS
Dept of Mechanical & Aerospace Engineering
Princeton University
Princeton, NJ 08544 - USA

DISCUSSION 1430

"Oscillating Supercritical Airfoils in the Transonic
Regime with Viscous Interactions" 1440

by Dr D. RIZZETTA and Dr H. YOSHIHARA
The Boeing Co, Military Airplane Division
MS 41-18
P.O. Box 3999
Seattle, WA 98124 - USA

DISCUSSION 1500

BREAK 1510

WEDNESDAY 17 SEPTEMBER (Cont'd)

"Couche Limite Turbulence Instationnaire: 1530
Etude Theorique et Experimentale"
by J. COUSTEIX & R. HOUEVILLE
ONERA, Division de l'Aerodynamique
29 ave de la Division Leclerc
92320 Chatillon - France

DISCUSSION 1550

"Viscous Effects on Unsteady Airloads 1600
of Oscillating Configurations"
by Dr-ing W. GEISSLER
DFVLR-Institut für Aeroelastik
AVA-Göttingen
Bunsenstrasse 10
3400 Göttingen - Germany

DISCUSSION 1620

GENERAL DISCUSSION - SESSION I 1630

ADJOURN 1710

THURSDAY 18 SEPTEMBER

SESSION II - PREDICTION METHODS AND COMPARISON
WITH EXPERIMENTS - Part 2

Chairman
Walter J. MYKYTOW
(AFFDL, Ret.)
824 Belmont Park North
Dayton, OH 45405 - USA

Recorder
J. GIESING

"Some Remarks on Boundary Layer Effects 0900
on Unsteady Airloads"
by Ir R. HOUWINK
National Aerospace Laboratory-NLR
Anthony Fokkerweg, 2
1059 CM Amsterdam - Netherlands

DISCUSSION 0920

"Prise en Compte d'Effets de Couche Limite 0930
Instationnaire dans un Calcul Bidimensionnel
Transsonique"
by M. COUSTON, J. J. ANGELINI
J. C. LE BALLEUR & P. GIROUDROUX-LAVIGNE
ONERA, Division des Structures
92320 Chatillon - France

DISCUSSION 0950

THURSDAY 18 SEPTEMBER (Cont'd)

"Experimental Flutter at High Subsonic Speeds and its Theoretical Prediction, taking into account Wing Incidence and Reynolds Number" by H C. GARNER Royal Aircraft Establishment Structures Department Farnborough, Hants GU14 6TD - UK and B W. PAYNE British Aerospace Aircraft Group Weybridge-Bristol Division Brooklands Road Weybridge, Surrey KT13 OSF - UK	1000
DISCUSSION	1020
BREAK	1030
"Analysis of Turbulent Flow about an Isolated Airfoil using a Time-Dependent Navier-Stokes Procedure" by Dr S J SHAMROTH and Dr H J GIBELING Scientific Research Associates Inc. P O Box 498 Glastonbury, CT 06033 - USA	1050
DISCUSSION	1110
GENERAL DISCUSSION - SESSION II	1120
LUNCH BREAK	1200

SESSION III - EXPERIMENTAL STUDIES

<u>Chairman</u>	<u>Recorder</u>
Dr IY H TIJDEMAN	Ir R.J. ZWAAN
National Aerospace Laboratory-NLR Anthony Fokkerweg, 2 1059 CM Amsterdam - Netherlands	

"Experimental Studies of Scale Effects on Oscillating Airfoils at Transonic Speeds" by Dr S S DAVIS NASA Ames Research Center M S 227-8 Moffett Field, CA 94035 - USA	1400
DISCUSSION	1420

THURSDAY 18 SEPTEMBER (Cont'd)

"Systematic Measurements of Two-Dimensional
Unsteady Aerodynamic Coefficients in the
Reynolds Number Regime 10^5 to 10^7 " 1430
by Prof Dr-Ing H. FORSCHING et al
Direktor der DFVLR-Institut für Aeroelastik
Bunsenstrasse 10
3400 Göttingen - Germany

DISCUSSION 1450

"Oscillating Flows from Shock-Induced Separations 1500
on Biconvex Aerofoils of Varying Thickness in
Ventilated Wind Tunnels"
by D G MABEY
Royal Aircraft Establishment
Dynamics Laboratory
Bedford MK41 6AE - UK

DISCUSSION 1520

BREAK 1530

"Experiments on a Turbulent Unsteady Boundary 1550
Layer with Separation"
by Sergio De PONTE
Politecnico di Milano
Istituto di Ingegneria Aerospaziale
via Golgi, 40
20.33 Milano - Italy

DISCUSSION 1610

GENERAL DISCUSSION - SESSION III 1620

SESSION IV - Round Table Discussion 1700

Chairman & Recorder:

Dr James J. OLSEN
Structures & Dynamics Division
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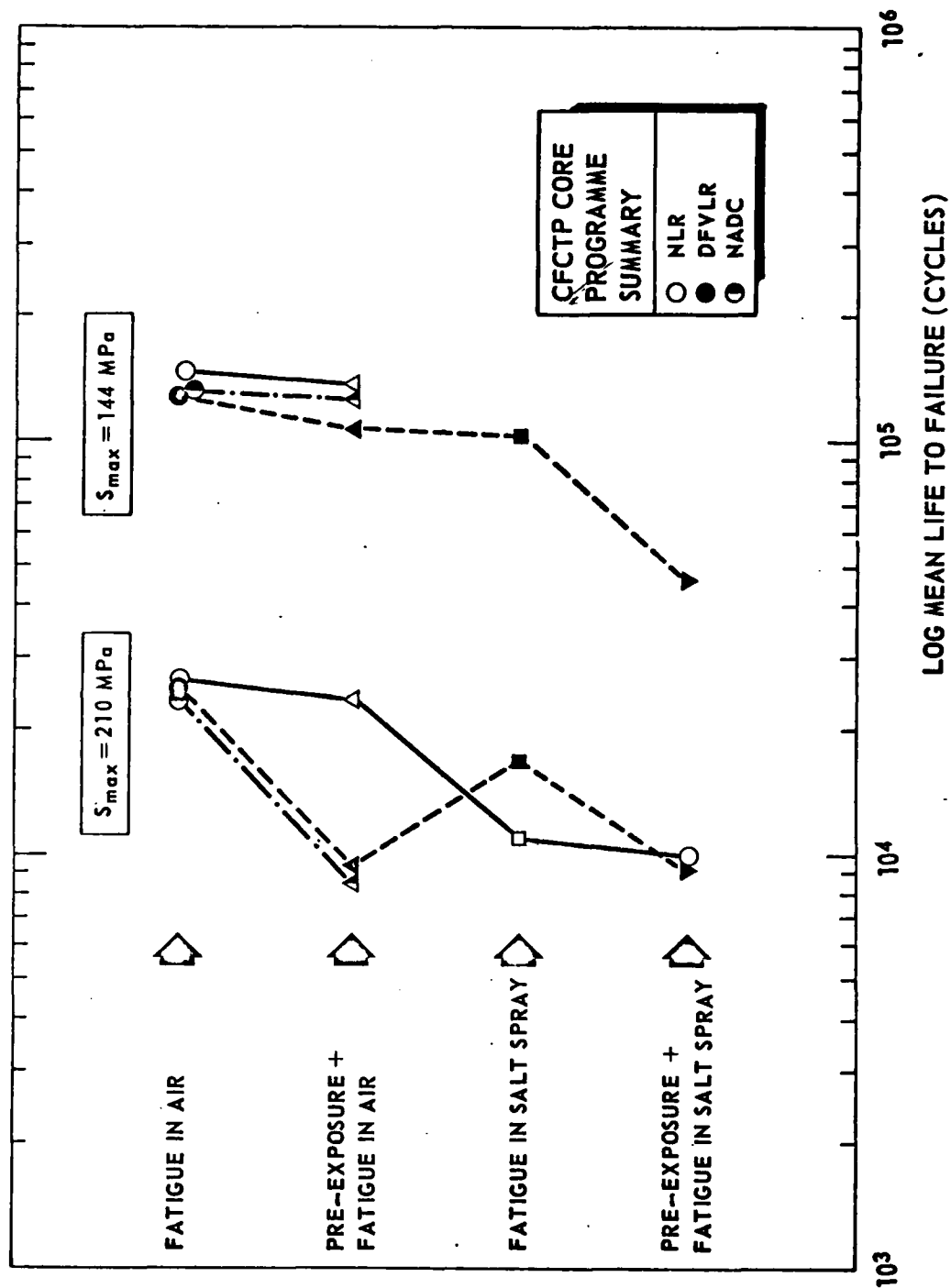
ADJOURN 1800

TABLE 1
CFCTP CORE PROGRAMME RESULTS PER 10 APRIL 1980

LABORATORY	FATIGUE LIFE TO FAILURE (CYCLES)							
	$S_{max} = 210 \text{ MPa}$				$S_{max} = 144 \text{ MPa}$			
	AIR	AIR + PRE-EXPOSURE	SALT SPRAY	SALT SPRAY + PRE-EXPOSURE	AIR	AIR + PRE-EXPOSURE	SALT SPRAY	SALT SPRAY + PRE-EXPOSURE
NLR	23,713	19,873	10,820	5,215	114,916	83,246		
	24,822	20,628	11,524	10,030	123,105	110,280		
	26,714	24,778		11,393	162,947	186,964		
	32,312	32,887		16,186	197,197	196,915		
	log mean : 26,698	log mean : 24,041	log mean : 11,166	log mean : 9,910	log mean : 146,016	log mean : 135,589		
DFVLR	24,479	5,393	11,370	5,652	103,842	86,862	54,165	31,200
	25,333	16,254	18,970	15,777	111,862	134,522	197,748	45,500
	25,841		22,546		181,364			71,021
	log mean : 25,211	log mean : 9,363	log mean : 16,942	log mean : 9,443	log mean : 128,194	log mean : 108,096	log mean : 103,494	log mean : 46,543
NADC	18,705	4,997			76,186	96,085		
	25,606	6,337			133,611	106,206		
	25,894	10,970			147,107	109,712		
	28,134	16,458			199,893	234,427		
	log mean : 24,304	log mean : 8,695			log mean : 131,533	log mean : 127,282		

FIGURE 1

CFCTP CORE PROGRAMME RESULTS PER 10 APRIL 1980



Terms of Reference for the
MANUAL ON AEROELASTICITY IN TURBOMACHINES
within the Aeroelasticity Sub-Committee

1. TITLE OF STUDY: MANUAL ON AEROELASTICITY IN TURBOMACHINES

Proposed by : Franklin O. CARTA - US

2. DESCRIPTION

A cooperative effort will be undertaken with PEP to begin joint work on a Manual on Aeroelasticity in Turbomachines with the objective of producing an AGARDograph on this subject in approximately 3 years. The activity will be coordinated by F.O. Carta of SMP and M.F. Platzer representing PEP. The coordinators will collaborate in selecting topics, recruiting the authors, and co-editing the final text. They will also participate by authoring portions of the text.

As envisioned the final document will be the turbomachinery equivalent of the AGARD Manual on Aeroelasticity for fixed wing aircraft. Its scope will cover unsteady aerodynamics (~7 chapters), structural dynamics (~7 chapters), applications (~4 chapters), special topics, future problems, etc (~3 chapters). Each chapter will have one or two authors, and as many as two additional contributors. Most of these individuals have been tentatively identified by the coordinators, and almost half are from outside the US.

There are two key requirements for this work. First, a single unified theme must pervade the entire work, including a self-consistent notation throughout, for maximum usefulness to the reader. This will be the responsibility of the coordinators acting as editors. Second, there must be a significant contribution to the work by a committed group of non-US authors. Funding for the authors will be derived either directly or indirectly from their own governments or agencies. Finally, the document will contain no information that is either classified or proprietary.

3. REASONS FOR AGARD INVOLVEMENT

This is envisioned as a multinational effort in a technical area of great importance for military applications. AGARD is the natural vehicle for implementing and carrying out the proposed program.

4. OBJECTIVES

To recruit a multinational group of experts in all phases of turbomachinery aeroelasticity who will write the several chapters of the proposed Manual.

To secure both permission to participate and financial sponsorship for each of the authors or contributors from their governments or their employers.

To coordinate the activities of these individuals under the aegis of both SMP and PEP to produce a useful document.

To consider the possibility of using the final document as the basis for an AGARD Lecture Series.

5. METHODS AND MEANS OF ACCOMPLISHMENT

There will be two major tasks, and the responsibility for accomplishing these tasks will be split as indicated below

- First, the coordinators (Carta and Platzer) will select the general topics and specific chapters to be covered, identify the several authors to be recruited, and make contact with them to obtain their willingness to participate.
- Second, AGARD, through the individual members of SMP and PEP, will assist the authors to secure both permission and funding from their governments and/or employers to work on this project.

In addition, the coordinators will communicate regularly with the authors, will attempt to maintain a reasonable schedule, will report twice yearly to both SMP and PEP, and will edit the final document.

6. MILESTONE LIST

Spring 1980	Receive formal approval from SMP and PEP.
Summer 1980	Contact authors and contributors, seek funding for participants with help from SMP and PEP members.
Fall 1980	Distribute initial version of Manual outline, consolidate notation list. Request author feedback in outline form.
Spring 1981	Distribute interim Manual outline, based on author feedback.
Spring 1982	Receive initial drafts from authors, begin editing process.
Fall 1982	Continue editing process. Perform text iteration with authors.
Spring 1983	Receive final draft from authors.
Summer 1983	Submit camera-ready copy to AGARD for publication.
Fall 1983 or Spring 1984	Initiate Lecture Series based on Manual.

Revised Terms of Reference for the Sub-Committee on
DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES

1. TITLE OF STUDY: DYNAMIC QUALIFICATION TECHNIQUES FOR
MILITARY AIRCRAFT WITH EXTERNAL STORES

Chairman : Prof Dr-Ing H. FÖRSCHING - GE

2. DESCRIPTION

For the proof of the safety and reliability of assembled stores and adapters, and for determining the resistance of equipment to the effects of natural and induced dynamic environments peculiar to military operations and requirements, numerous dynamic qualification test methods have been established. They are compiled for military aircraft in Military Standards. For instance, the MIL-STD-810c recommends various test procedures, but should not be used as a rigorous specification of test levels.

The practical application of standard test methods for the dynamic qualification of aircraft stores and aircraft equipment is deliberately left to expert interpretation. However, many problems and open questions are involved, and a general appraisal is required from government agencies and aircraft manufacturers, taking into account new test procedures and concepts.

3. REASONS FOR AGARD INVOLVEMENT

There exists an increased interest in commonality, intercapability and standardization in the NATO member nations. Periodic review of standard qualification methods, a reasonable interpretation and proper use of these standards, and the incorporation of new technical findings is a practical necessity. This can be served by the effort to exchange technical information between all AGARD countries concerning the state-of-the-art, and to try to formulate a common basis for dynamic structural qualification requirements and substantiation procedures.

4. OBJECTIVES

Major objectives of the proposed activities are:

Review and evaluation of the dynamic qualification techniques for aircraft equipment and external stores.

Improvement of environmental test methods and related analytical procedures.

Dissemination of technical expertise and practical experience in dynamic qualification of equipment and external stores for the prevention of failures due to dynamic loads.

Correlation of simulated and service-measured vibration environments.

Collection and publication of the elaborated results in a Proceedings of a Specialists Meeting and possibly a Lecture Series.

5. METHODS AND MEANS OF ACCOMPLISHMENT

A Sub-Committee will be formed from SMP Members. Experts from aircraft companies and government agencies occasionally will assist the members to prepare a Specialists Meeting on the following subjects:

Review of the state-of-the-art of dynamic qualification techniques and test methods.

Review of the background, intentions and rationale of related Military Standard Publications.

Review of parallel efforts within the various nations, NATO and other international organizations to develop standardized techniques for dynamic qualification.

Determination of environmental inputs from deterministic and random sources, such as: gunfire, hard landings, rough runways, turbulence, buffet, store-ejection, maneuvers, and noise. The use of such sources in dynamic qualification of ECM pods, fuel tanks, bombs, missiles, launchers, and adapters.

Performance of forced vibration analysis, in particular computer techniques for the development of criteria for the equivalence of deterministic and statistical concepts for stationary and transient conditions.

Correlation of dynamic ground test results with service experience.

Evaluation of possible improvements in prediction methods and test techniques

6. MILESTONE LIST

Fall	1979	Formation of a Sub-Committee
Spring	1980	Elaboration of Terms of Reference and Topics
Fall	1980	Selection of Papers and Authors
Spring or Fall	1981	Specialists Meeting on "Dynamic Environmental Qualification Techniques for Military Aircraft with External Stores"

Draft Terms of Reference for a Sub-Committee on
MATERIALS FOR SPACE APPLICATIONS

1. TITLE OF STUDY: ENVIRONMENTAL EFFECTS ON MATERIALS
FOR SPACE APPLICATIONS

Proposed by : Prof P. SANTINI - IT

2. DESCRIPTION

Systems requirements for future spacecraft and antenna with long duration of flight exert significant constraints on the design of the structure. To meet these requirements, the structural engineer must have an understanding of the unique effects of the space environment on the materials of construction, and the materials must be characterized under these conditions. The need now exists to establish the current state-of-the-art of materials characterization data and methods of testing. Further, future spacecraft and antenna are likely to use advanced composite materials which are more sensitive to the space environment than the metallic materials

The properties of interest are;

1. Mechanical properties
2. Surface properties (thermal and optical)
3. Electrical properties
4. Thermal properties

The elements of the environment are:

1. Temperature
2. Vacuum
3. Radiation
4. Charged particles
5. UV Radiation
6. Micrometeoroid
7. Contamination
8. Pre-launch terrestrial environment

It is important that experimental techniques consider the phasing of the environment elements, methods of testing and potentials for time acceleration of the environment

3. REASONS FOR AGARD INVOLVEMENT

There exists an increasing need for AGARD to give more emphasis to space related problems. This is essentially due to increasing space activity in the various NATO countries. Review and systematic presentation of existing data on a basis of commonality might lead to very useful results from several standpoints (a) industrial; (b) military; (c) scientific.

4. OBJECTIVES

- a. To have basic information for an efficient structural design of dimensionally accurate communications, navigation and surveillance satellite components (such as antenna dishes, platforms, microwave filters).
- b. To have basic knowledge of the physical implications of space environment on properties of materials.
- c. To collect existing data on the variation of material properties with the environment, both in space and on the ground.

5. MEANS AND METHODS OF ACCOMPLISHMENT

A Sub-Committee will be formed with SMP Members, from both the materials and the structures areas. The cooperation of the two areas is essential for the successful accomplishment of the task. Experts from Space Industries and Government Agencies will occasionally assist the members in finding the authors to prepare a Specialists Meeting on the subject of the study.

6. MILESTONE LIST

- | | | |
|-------------|----|---|
| Spring 1980 | 1 | Approval of Terms of Reference in a final form. |
| | 2. | Review of Members of ad hoc Group; check of their interest in the work. |
| Fall 1980 | 1. | Define Meeting Topics in a more detailed form. |
| | 2. | Establish tentative programme of Specialists Meeting and Sessions. |
| Spring 1981 | 1. | Negotiate country involvement in papers contributions. |
| | 2. | Review and freeze subjects for individual Sessions. |
| Fall 1981 | | Selection of papers, Chairmen and Rapporteurs. |
| Spring 1982 | | Confirm authors participation, Session Chairmen and Rapporteurs. |
| Fall 1982 | | Specialists Meeting |

Revised Terms of Reference for the Sub-Committee on
DYNAMIC RESPONSE TO DAMAGED RUNWAYS

1. TITLE OF STUDY: AIRCRAFT DYNAMIC RESPONSE TO DAMAGED
AND REPAIRED RUNWAYS

Chairman : Dr J.J. OLSEN US

2. DESCRIPTION

During emergency operations, NATO Tactical Air Forces must conduct sustained launch and recovery operations from airfields which have been damaged by enemy attack. Taxi, landing and takeoff on damaged runways (or runways that have been rapidly repaired) can cause peak structural loads which exceed current design values. This is particularly true for heavy-weight tactical fighters with large external stores. NATO Air Forces must have assurance that their aircraft will be able to tolerate a severe war-time environment and be able to operate from a multitude of airfields.

There is a requirement to assess the characteristics of NATO runways, survey the aircraft which will operate on these surfaces, determine the aircraft structural dynamic response, develop criteria for the repair of the surface, evaluate the structural response to operation on the runways which have been hastily repaired, and formulate design criteria for future aircraft.

3. REASONS FOR AGARD INVOLVEMENT

NATO Tactical Air Forces are deployed in many of the AGARD countries. The types and weights of operational aircraft, their external stores, expected runway damage, and runway repair procedures vary greatly from country to country. AGARD is the logical forum to bring together the necessary NATO-wide talents with respect to runway profiles, aircraft structural/dynamic descriptions, landing gear modelling, evaluation of aircraft loads and response, development of repair criteria to allow operation of existing aircraft from damaged runways, and development of structural design criteria for future aircraft.

4. OBJECTIVES

Develop methods to determine the structural integrity of existing NATO tactical aircraft for operation on damaged and repaired runways.

Develop criteria (based on aircraft dynamic response) to determine when damaged runways should be repaired and how smooth the repairs must be.

Develop structural criteria for the design of future aircraft to tolerate damaged and repaired runways.

5. METHOD AND MEANS OF ACCOMPLISHMENT

A Sub-Committee will contact other AGARD Panels, the Military Committee and technical experts within the NATO countries to develop a Specialists Meeting

6. MILESTONE LIST

- | | |
|-------------|--|
| Fall 1979 | Create a Sub-Committee to lay out a detailed program and establish contact with the Military Committee and other AGARD Panels. |
| Spring 1980 | Agree on the Terms of Reference, a topics list for the Specialists Meeting and potential contributors. |
| Fall 1980 | Construct the final technical program. |
| Spring 1982 | Specialists Meeting. |

7. TENTATIVE TOPICS LIST FOR SPECIALISTS MEETING

- a. Current (pre-damage) runway roughness - Does the existing roughness vary from nation to nation? How do you classify roughness?
- b. The expected post-repair runway profiles.
- c. The mathematical modelling of the stiffness, inertia and damping characteristics of:
 - aircraft tyres
 - landing gear struts
 - primary aircraft structure
 - pylons, launchers, tanks, bombs, missiles
- d. Laboratory component testing techniques to verify mathematical models.
- e. Full-scale flight (taxi) tests to demonstrate validity of analytical and laboratory results.
- f. Does runway stiffness, inertia play a significant role in aircraft dynamic response?
- g. Requirements of the design authorities, aircraft and landing gear manufacturers, and military field commanders. How do they differ?
- h. Procedures to simplify and hasten mathematical modelling, laboratory tests, and flight tests while still obtaining the necessary data. Effects on accuracy, cost safety
- i. Recommend criteria for: runway repair; rigor of analyses and testing; landing gear, tyre and structural design.

Revised Terms of Reference for the Working Group on
FATIGUE RATED FASTENER SYSTEMS

1. TITLE OF STUDY: FATIGUE RATED FASTENER SYSTEMS

Chairman : W.G. HEATH - UK

2. DESCRIPTION

A cooperative programme is proposed in which all interested AGARD members participate. Fatigue lives will be determined for a range of fatigue rated fastener systems in combination with a number of hole preparation techniques.

Low, medium and high load transfer joints will be investigated using several aluminium alloys together with faying surface treatment and assembly processes. Fatigue testing will be carried out at several load levels using mainly FALSTAFF loading; some tests will be performed under TWIST loading.

Fatigue lives will be evaluated in terms of installation costs of fastener system and hole preparation technique used.

Because of the lack of a standard specimen for evaluating the fastener system used in high load transfer joints, a range of designs will be evaluated and compared.

3. REASONS FOR AGARD INVOLVEMENT

- a. The Critically Loaded Holes Technology Pilot Programme has been successfully completed: complex fatigue tests can be carried out with consistency between participating countries.
The study of loaded holes should be extended by producing and evaluating data on fatigue rated fastener systems.
- b. An effective attack on the subject programme requires international cooperation.
- c. Since the programme focuses on military applications of fatigue rated fastener systems AGARD is the natural forum.

In carrying out the Critically Loaded Hole Technology Pilot Programme the participants have achieved good communications, procedures and working relationships.

The Fatigue Rated Fastener System Programme full advantage can be taken of these favourable working arrangements.

4. OBJECTIVES

- a. Determination of fatigue lives for a range of fatigue rated fastener systems and material in combination with a number of hole preparation techniques.
- b. Establishment of cost figures in relation to the fatigue performance.
- c. Identification of the prime parameters involved in fastener system selection.
- d. Development of a reference datum for the comparison of test results produced in different countries using different specimen geometries.
- e. Development of experimental methods for fastener system fatigue rating

5. METHODS AND MEANS OF ACCOMPLISHMENT

A collaborative programme will be defined by assembling work programmes proposed by the participants, having adjusted them to eliminate unnecessary duplication and obtain best overall problem coverage.

Where necessary a core programme will be defined to correlate the results obtained by different specimens. A coordinator has been nominated.

6. MILESTONE LIST

- | | |
|-------------|---|
| Spring 1980 | First definition of the programme content (as one of the final outputs from the Critically Loaded Hole Programme) |
| Fall 1980 | Agreement of total programme content and the contributions made by each participant
Confirmation of programme coordination arrangements. |
| Fall 1982 | Exchange and discussions of final results and preparation of a report |

Proposed Terms of Reference for a Sub-Committee on
NDT OF CERAMICS FOR TURBINES

1. TITLE OF STUDY: CHARACTERIZATION, PROPERTIES AND NDT OF SPECIAL CERAMICS FOR TURBINE ENGINE APPLICATIONS

Proposed by : Dr C.P. GALOTTO - IT

2. DESCRIPTION

The exploitation of the unique properties of engineering ceramic materials requires methods of ascertaining properties at the production stage and after appropriate service periods. In particular, their applicability is very much dependent on practical and reliable NDT methods for the detection of defects which might effect the component integrity, and on a proper evaluation of their high temperature properties and limits.

Notwithstanding the remarkable amount of data generated in recent years, there is a lack of knowledge of some properties of silicon nitride and silicon carbide base materials and of standard methods to cross compare the results obtained at the various laboratories.

The spectrum of relevant parameters has to be widened so as to include systematically oxidation and corrosion resistance, creep, thermal fatigue, fracture propagation, thermal exchange versus fabrication technologies and testing methods for evaluation.

Furthermore, before developing suitable NDT methods, one needs to know the kinds of defects, their size and distribution to be considered during manufacturing and service in order to avoid catastrophic failures.

All these have to be reviewed and discussed with designers for the correct use of the data and their utilization in engine development.

3. REASONS FOR AGARD INVOLVEMENT

There is at present a marked interest of all the NATO nations in the development of improved engines with high thrust to weight and thrust to unit volume ratio. This appears to be strictly related to the utilization of ceramic components for engineering applications.

The Structures and Materials Panel has already organized a Specialists Meeting on "Ceramics for Turbine Engine Applications" which aroused considerable interest amongst the participants. It was clear from the discussion at this Meeting that after 10 years of significant progress in the development of the technology, silicon nitride and silicon carbide are now available for component production.

In spite of these improvements, their use by the designers is hindered by two main problems; development and introduction of accurate life prediction methodologies, and a proper and complete evaluation of the materials properties with particular reference to corrosion resistance, thermal fatigue and creep behaviour. Much effort in the research programmes of the NATO countries is now directed to the attainment of these goals. On the other hand, a Specialists Meeting on NDI held in Norway two years ago pointed out the lack of information concerning engineering materials.

The Structures and Materials Panel is an ideal forum to bring the designers and the materials specialists together, to assess the state of development of NDT methods, to cross compare the results at the various laboratories on properties evaluation, and to point out future requirements in this field.

4. OBJECTIVES

Major objectives of the proposed activities are:

Review of the state-of-the-art of existing non-destructive techniques and test methods for special ceramics;

Evaluation of possible future improvements in NDT and prediction methods;

Correlation between NDT and life prediction of materials and components;

Comparison of test results produced in different countries using different geometric specimens and test conditions, with particular reference to corrosion, oxidation and fatigue behaviour;

Bring together designers and materials specialists for a full exchange of views, pointing out their respective requirements.

5. METHODS AND MEANS OF ACCOMPLISHMENT

Organization of a Specialists Meeting to review the current state of knowledge in non-destructive techniques, test methods and high temperature mechanical and chemico-physical properties of special ceramics for engine applications

6. MILESTONE LIST

Fall	1980	Establishment of Sub-Committee, preliminary discussion on topic areas and possible contributors.
Spring	1981	Agree outline of programme for Specialists Meeting
Fall	1981	Preliminary selection of contributions
Spring	1982	Final definition of programme and contributions
Fall	1982	Review of arrangements
Spring	1983	Specialists Meeting
Fall	1983	Publication of Proceedings of the Specialists Meeting.

STRUCTURES AND MATERIALS PANEL
SCHEDULE OF SPECIALISTS MEETINGS

FALL 1980 - 51st MEETING

AIX-en-PROVENCE, FRANCE
15-17 September

Helicopter Fatigue (2 days)
Life Assessment

17-18 September

Boundary Layer Effects (1 1/2 days)
on Unsteady Airloads

SPRING 1981 - 52nd MEETING

ÇEŞME, TURKEY
6-7 April

Aircraft Corrosion (2 days)

8-9 April

Corrosion Fatigue (1 day)

FALL 1981 - 53rd MEETING

NOORDWIJKERHOUT
Netherlands
27-28 September

Maintenance in Service (2 days)
of High Temperature Parts

30 Sept-1 Oct

Dynamic Environmental (2 days)
Qualification Techniques

SPRING 1982 - 54th MEETING

BELGIUM (provisional)
18-23 April (suggested)

Advanced Casting (2 days)
Technology

Dynamic Response to Damaged
and Repaired Runways (2 days)

FALL 1982 - 55th MEETING

CANADA (provisional)
19-24 September (suggested)

Environmental Effects on
Materials for Space
Applications

Effects of Short Cracks on
Aeronautical Components

SPRING 1983 - 56th MEETING

PORTUGAL (proposed)

Characterization and Significance
of Damage in Composite Materials

FALL 1983 - 57th MEETING

UK (proposed)

(to be selected)

WORKING ACTIVITY PLANNING CHART

	FIELD	ACTIVITY	1980	1981	1982	1983		
MATERIALS	MATERIALS PROPERTIES	MATERIALS FOR SPACE APPLICATIONS COMPOSITE MATERIALS	M A S	M A S	M A S	M A S		
	MATERIALS CONCEPTS AND PROCESSING	ADVANCED CASTING TECHNOLOGY NDT OF CERAMIC MATERIALS	S S A	S S A	M S	M S		
	RELIABILITY AND MAINTAINABILITY	MAINTENANCE OF HIGH TEMPERATURE PARTS	S S S	S S M	S	S		
		CORROSION FATIGUE	S S S	M S P	S	S		
		CORROSION CRITICALLY LOADED HOLES FATIGUE RATED FASTENER SYSTEMS	S S P W W P	M S S W W P	P S S W W P	S S S W W P		
		R & D COOPERATION	S S S	S S S	S S S	S S S		
STRUCTURES	DESIGN METHODOLOGY	FRACTURE MECHANICS DESIGN METHODOLOGY	P = A					
		FACTORS OF SAFETY	S S S	P S S				
		HELICOPTER FATIGUE	W M P	W M P				
		IMPACT DAMAGE TOLERANCE EFFECTS OF SHORT CRACKS	A P P P P A	P P P P P A	M S S	M S S		
	STRUCTURAL LOADS AND DYNAMICS	DYNAMIC RESPONSE TO DAMAGED RUNWAYS AEROELASTICITY	S S M W S	S S M S S	M S S S S	P S S S S		
STANDARD AEROELASTIC CONFIGURATIONS DYNAMIC ENVIRONMENTAL QUALIFICATION		S S P S S	S S M S S	S S M S S				
	TOTALS	W S A UNDEFINED ACTIVITIES	2 11 2 0	2 10 3 0	2 8 0 4	1 7 0 5	0 3 0 3	
		TOTAL WORKING ACTIVITIES	15	15	14	13	10	6

M - SPECIALISTS MEETINGS
P - MAJOR PUBLICATIONS

ATTACHMENT 8

STRUCTURES AND MATERIALS PANEL
TECHNICAL PROGRAMME 1980-1982

PROJECT	TASK	PROGRAM DATE	ACTION	Task No	BUDGET - FF		
				Pub No	1980	1981	1982

AEROELASTICITY - TX.47 (SMP/SC.01)

Pilot Papers 1. O'CONNELL 2. LAMBOURNE				08-901	-	-	-
				08-904	-	-	-
				R-683	6500	-	-
	CR to printer	JAN 1980	Exec.	R-673	9200	-	-
Pilot Papers 1. DE FERRARI & ZIMMERMANN 2. COUSTON 3. HWANG et al	Presented	APR 1980	Authors	08-072	-	-	-
	Camera-ready	JUN 1980	"	08-073	-	-	-
	Prefaces (3)	"	COUPRY	08-074	-	-	-
				R-687	-	-	-
	CR to printer	"	Exec.	R-688	-	-	-
				R-	22000	-	-
Specialists Meeting "Boundary Layer Effects on Unsteady Airloads" (Fall 1980)	Presented	SEP 1980	Authors	08-903	-	-	-
	Camera-ready	NOV 1980	"		-	-	-
	Preface	"	COUPRY	CP-	-	-	-
	CR to printer	"	Exec.	(200pp)	30000	-	-
AGARDograph (1983) "Aeroelasticity in Turbomachines"	Initial outline	SEP 1980	CARTA	08-103	-	-	-
	Contracts	JAN 1981	"/Exec.		-	10000	-
	Interim outline	APR 1981	"		-	-	-
	Contracts	JAN 1982	"/Exec.		-	-	15000
	Initial drafts	APR 1982	Authors		-	-	-
	Final draft	APR 1983	"		-	-	-
	Camera-ready	JUN 1983	"		-	-	-
	Preface	"	CARTA	AG-	-	-	-
	CR to printer	JUL 1983	Exec.	(? pp)	-	-	-

IMPACT DAMAGE TOLERANCE OF STRUCTURES - T. 63

Design Manual	Contract	JUN 1980	COLLIER/	08-792	-	-	-
	CR, Vol I	? 1980	AVERY Exec	(30pp)	8000	-	-
	Preface	? 1980	HARPUR		-	-	-
	CR, Vol II	NOV 1980	AVERY		-	-	-
	Vol II to printer	" "	Exec	(? pp)	30000	-	-
	Draft, Vol III	? 1980	AVERY		-	-	-
	CR, Vol III	? 1981	"		-	-	-
	Vol III to printer	? 1981	Exec	(? pp)	-	10000	-
				AG-238			

PROJECT	TASK	PROGRAM DATE	ACTION	Task No Pub No	BUDGET - FF		
					1980	1981	1982

FRACTURE MECHANICS DESIGN METHODOLOGY - T. 64

AGARDograph "Practical Applications of Fracture Mechanics"	CR to printer	JAN 1980	Exec.	08-889	-	-	-
				AG-257	95000	-	-

COMPOSITE MATERIALS - TX.72 (SMP/SC.06)

Specialists Meeting "Effect of Service Environment on Composite Matls." (Spring 1980)	Presented	APR 1980	Authors	08-902	-	-	-
	Camera-ready	MAY 1980	"		-	-	-
	Preface	"	JUBE	CP-288	-	-	-
	CR to printer	"	Exec.	(350pp)	50000	-	-

CRITICALLY LOADED HOLE TECHNOLOGY - TX.73 (SMP/SC.05)

Cooperative Program "Effect of Hole Quality on Fatigue Life"	Draft Report	APR 1980	URZI/COOMBE	08-860	-	-	-
	Camera-ready	SEP 1980	" "		-	-	-
	Preface	"	PETERSON		-	-	-
	CR to printer	"	Exec.	R-678	7600	-	-

CORROSION FATIGUE - Tx 76 (SMP/SC.09)

Specialists Meeting (Spring 1981)	Complete Program	JUL 1980	v. LEEUWEN		-	-	-
	Contracts (1981)	AUG 1980	Exec.	08-058	14000	-	-
	Presented	APR 1981	Authors		-	-	-
	Camera-ready	MAY 1981	"		-	-	-
	Preface	"	v. LEEUWEN	08-158	-	-	-
	CR to printer	"	Exec.	CP- (120pp)	-	18000	-
Cooperative Program Manual	Draft Manual	SEP 1981	WANHILL/ De LUCCIA	08-158	-	-	-
	Camera-ready	NOV 1981	"		-	-	-
	Preface	"	v. LEEUWEN		-	-	-
	CR to printer	"	Exec	R- (120pp)	-	18000	-

PROJECT	TASK	PROGRAM DATE	ACTION	Task No Pub No	BUDGET - FF		
					1980	1981	1982

FACTORS OF SAFETY - TX 77 (SMP/SC.14)

Evaluation of Data	Complete compilation	OCT 1980	STRUCK/ SCHMID	08-952	-	-	-
	Draft Report	OCT 1980	"		-	-	-
	Camera-ready	JAN 1981	"		-	-	-
	Preface	"	MEYER-JENS		-	-	-
	CR to printer	"	Exec.	R-677	-	8000	-

CORROSION - TX 80 (SMP/SC.11)

Handbook	Contracts (1980 tasks)	1980	KEARNS/ Exec.	08-963	*	-	-
	(1981 tasks)	AUG 1980	" "	08-063	10000	-	-
	(1982 tasks)	AUG 1981	" "	08-163	-	10000	-
	Final draft, Vol I	SEP 1981	(?)		-	-	-
	Manuscript	DEC 1981	(?)		-	-	-
	Preface, Vol I	"	KEARNS		-	-	-
	Copy to printer	JAN 1982	Exec.	AG- (150pp)	-	-	35000
Specialists Meeting (Spring 1981)	Complete Program	JUL 1980	KEARNS	08-163	-	-	-
	Presented	APR 1981	Authors		-	-	-
	Camera-ready	MAY 1981	"		-	-	-
	Preface	"	KEARNS		-	-	-
	CR to printer	"	Exec.	CP- (200pp)	-	30000	-
	Tech Eval Report	AUG 1981	KEARNS	AR ?	-	3000	-
* FF 13000 in 1979 budget							

R & D COOPERATION - TX 82 (SMP/SC.13)

Sponsorship of Cooperative Programs	Identification of Projects	Indef	KEARNS	None	-	-	-
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STANDARD AEROELASTIC CONFIGURATIONS - TX 84 (SMP/WG.19)

Establish Configurations (Phase 2)	Camera-ready	AUG 1980	BLAND	08-068	-	-	-
	Preface	"	OLSEN		-	-	-
	CR to printer	SEP 1980	Exec.	AR-146 (30pp)	8000	-	-

PROJECT	TASK	PROGRAM DATE	ACTION	Task No Pub No	BUDGET - FF		
					1980	1981	1982

HELICOPTER FATIGUE - TX.86 (SMP/WG.20)

Specialists Meeting "Fatigue of Helicopters" (Fall 1980)	Presented	SEP 1980	Authors	08-090	-	-	-
	Camera-ready	NOV 1980	"		-	-	-
	Preface	"	FEHRENBACH		-	-	-
	CR to printer	"	Exec.	CP- (250pp)	40000	-	-
Handbook	Contract	DEC 1980	FEHRENBACH	08-079	7400	-	-
	Draft	APR 1981	Exec.		-	-	-
	WG termination	"	NDB		-	-	-
	Camera-ready	JUN 1981	Authors	08-179	-	-	-
	Preface	"	FEHRENBACH		-	-	-
	CR to printer	"	Exec.	AG- (200pp)	-	30000	-

DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES - TX.87 (SMP/SC.15)

Specialists Meeting (Fall 1981)	Provis. Program	SEP 1980	FÖRSCHING	08-199	-	-	-
	Complete Program	JAN 1981	"		-	-	-
	Presented	SEP 1981	Authors		-	-	-
	Camera-ready	NOV 1981	"		-	-	-
	Preface	"	FÖRSCHING		-	-	-
	CR to printer	"	Exec.	CP- (200pp)	-	30000	-
	Tech Eval Report	FEB 1982	FÖRSCHING	AR ?	-	-	-

MATERIALS FOR SPACE APPLICATIONS - T. 88

Pilot Papers AHMED, RUSSELL & CLEMMET	Presented	OCT 1979	Authors	08-071	-	-	-
	Camera-ready	NOV 1979	"		-	-	-
	Preface	"	SANTINI		-	-	-
	CR to printer	JAN 1980	Exec.	R-676	9100	-	-
Specialists Meeting (Fall 1982)	Provis. Program	SEP 1981	SANTINI	08-	-	-	-
	Complete Program	JAN 1982	"		-	-	-
	Presented	SEP 1982	Authors		-	-	-
	Camera-ready	NOV 1982	"		-	-	-
	Preface	"	SANTINI		-	-	-
	CR to printer	"	Exec.	CP- (200pp)	-	-	35000
	Tech Eval Report	FEB 1983	SANTINI ?	AR ?	-	-	-

PROJECT	TASK	PROGRAM DATE	ACTION	Task No Pub No	BUDGET - FF		
					1980	1981	1982

DYNAMIC RESPONSE TO DAMAGED RUNWAYS - TX 89 (SMP/SC 16)

Pilot Papers CALDWELL, PAYNE & KRAUSS				08-910	-	-	-
	CR to printer	JAN 1980	Exec	R-685	9900	-	-
Specialists Meeting (Spring 1982)	Provis Program	APR 1981	OLSEN	08-	-	-	-
	Complete Program	JUL 1981	"		-	-	-
	Presented	APR 1982	Authors		-	-	-
	Camera-ready	MAY 1982	"		-	-	-
	Preface	"	OLSEN	CP-	-	-	-
	CR to printer	"	Exec	(200pp)	-	-	35000
	Tech Eval Report	AUG 1982	OLSEN ?	AR ?	-	-	-

ADVANCED CASTING TECHNOLOGY - TX 91 (SMP/SC 17)

Specialists Meeting (Spring 1982)	Provis Program	APR 1981	LEE	08-	-	-	-
	Complete Program	JUL 1981	"		-	-	-
	Presented	APR 1982	Authors		-	-	-
	Camera-ready	MAY 1982	"		-	-	-
	Preface	"	LEE	CP-	-	-	-
	CR to printer	"	Exec	(200pp)	-	-	35000
	Tech Eval Report	AUG 1982	LEE ?	AR ?	-	-	-

MAINTENANCE IN SERVICE OF HIGH TEMPERATURE PARTS - TX 92 (SMP/18)

Specialists Meeting (Fall 1981)	Provis Program	SEP 1980	LEWIS	08-101	-	-	-
	Complete Program	JAN 1981	"		-	-	-
	Presented	SEP 1981	Authors		-	-	-
	Camera-ready	NOV 1981	"		-	-	-
	Preface	"	LEWIS	CP-	-	-	-
	CR to printer	"	Exec	(200pp)	-	30000	-
	Tech Eval Report	FEB 1982	LEWIS ?	AR ?	-	-	-

FATIGUE RATED FASTENER SYSTEMS - TX 93 (SMP/WG 21)

Cooperative Program	Final definition	SEP 1980	HEATH	08-070	-	-	-
	Contract (1981)	OCT 1980	" / Exec		8000	-	-
	" (1982)	AUG 1981	" "	08-170	-	8600	-
	Draft Report	SEP 1982	Coordinator		-	-	-
	WG termination	"	NDB		-	-	-
	Camera-ready	NOV 1982	Coordinator		-	-	-
	Preface	"	HEATH	R-	-	-	-
	CR to printer	"	Exec	(1 pp)	-	-	10000

PROJECT	TASK	PROGRAM DATE	ACTION	Task No Pub No	BUDGET - FF		
					1980	1981	1982

EFFECTS OF SHORT CRACKS - T. 94

Specialists Meeting (Fall 1982)	Provis. Program	SEP 1981	ZOCHER	08-	-	-	-
	Complete Program	JAN 1982	"		-	-	-
	Presented	SEP 1982	Authors		-	-	-
	Camera-ready	NOV 1982	"		-	-	-
	Preface	"	ZOCHER	CP-	-	-	-
	CR to printer	"	Exec.	(200pp)	-	-	35000

NDT OF CERAMIC MATERIALS - T. 95

Pilot Papers	Presented	APR 1981	Authors	08-105	-	-	-
	Camera-ready	JUN 1981	"		-	-	-
	Preface	"	GALOTTO	R-	-	-	-
	CR to printer	"	Exec.	(? pp)	-	10000	-
Specialists Meeting (Spring 1983?)	Provis. Program	APR 1982	GALOTTO	08-	-	-	-

MANUAL ON FATIGUE - TX.18.6

Vol II, Chapter 7	Translation	JUN 1980	SPE	08-935	-	-	-
	Author check	JUL 1980	BARROIS		-	-	-
	Copy to printer	"	Exec.	MAN-10	36000	-	-
Vol II, Chapter 8	Camera-ready	MAR 1981	BARROIS	08-035	-	-	-
	Panel approval	APR 1981	Edit. Comm.		-	-	-
	CR to printer	"	Exec.		-	14000	-
	Translation	JUN 1981	SPE		-	-	-
	Author check	JUL 1981	BARROIS	08-135	-	-	-
	Copy to printer	"	Exec.	MAN-11	-	24000	-
Vol II, Chapter 9				08- MAN-12	-	-	-

8000 30000 40000

- 18000 -

1979

BUDGET SUMMARY

1979 - 1982

Committed		165700	-	-
Probable		209600	172000	150000
SUB-TOTAL		375300	172000	150000
Uncertain		33400	129600	90000
GRAND TOTAL	175200	408700	301600	240000
NDB Approved	323000	350200	301600	-

STRUCTURES AND MATERIALS PANEL

STATUS OF PUBLICATIONS

November 1979 - May 1980

PUBLISHED

- R-682 DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES
- Published November 1979, 42 pp.
- CP-276 Specialists Meeting on
CERAMICS FOR TURBINE ENGINE APPLICATIONS
- Published March 1980, 364 pp.
- R-673 COMPARATIVE MEASUREMENTS IN FOUR EUROPEAN WIND
TUNNELS OF THE UNSTEADY PRESSURES ON AN OSCILLATING
MODEL (THE NORA EXPERIMENTS)
by N. Lambcurne, K. Kienappel, R. Destuynder and R. Roos
- Published February 1980, 48 pp.
- R-683 DESIGN, DEVELOPMENT AND IMPLEMENTATION OF AN ACTIVE
CONTROL SYSTEM FOR LOAD ALLEVIATION FOR A COMMERCIAL
TRANSPORT AIRPLANE
by R. F. O'Connell
- Published February 1980, 20 pp.
- R-685 AIRCRAFT DYNAMIC RESPONSE TO DAMAGED RUNWAYS
- Published March 1980, 36 pp.
- AG-257 PRACTICAL APPLICATIONS OF FRACTURE MECHANICS
Edited by H. Liebowitz
- Published May 1980, 440 pp.
- R-676 REQUIREMENTS, DESIGN AND DEVELOPMENT OF LARGE
SPACE ANTENNA STRUCTURES
- Published May 1980, 50 pp.

PERSONAL ACTION INDEXALL PANEL MEMBERS

4.2.2a, 4.4.3, 5

NATIONAL PANEL COORDINATORS

2.02.1d, 2.07.1e, 2.17.3b, 7.3.1b

WORKING ACTIVITY MEMBERS

T. 64	FRACTURE MECHANICS	2.03.1c
TX.72	COMPOSITE MATERIALS	2.03.1c, 2.04.1e, 2.04.2a
TX.76	CORROSION FATIGUE	2.06.1d
TX.77	FACTORS OF SAFETY	2.07.1e
TX.84	STANDARD AERO. CONFIGURATIONS	2.10.1b
TX.86	HELICOPTER FATIGUE	2.11.1c
T. 88	DIMENSIONALLY STABLE STRUCTURES	2.13.2b
TX.89	DAMAGED RUNWAYS	2.14.1d
TX.91	ADVANCED CASTING TECHNOLOGY	2.15.1a
TX.92	MAINTENANCE OF HIGH TEMPERATURE PARTS	2.16.1c

INDIVIDUAL PANEL MEMBERS

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KLOUMAN	2.03.1a
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LEWIS	2.06.1j, 2.08.1d, 2.13.2a

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STRUCTURES AND MATERIALS PANEL. SUMMARY RECORD OF THE PANEL MEE--ETC(U)
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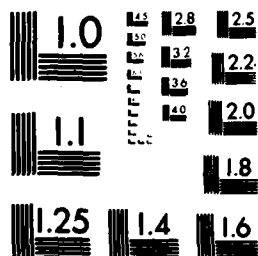
MEYER-
MOLYNE
OLSEN
ROBSON
SIGNOR
SPANOS

TIJDEM
TOVAR
WALLAC
WRIGHT
YEGINO
ZOCHER

COORDINATO

AVERY
BLAND

EXECUTIVE



MICROCOPY RESOLUTION TEST CHART
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WRIGHT	2.08.1d
YEGINOBALI	2.08.1c, 2.09.1b, 2.09.1e
ZOCHER	2.03.2b, 2.06.1j, 2.07.2a, 2.14.1d, 3.2.1b

COORDINATORS

AVERY	2.02.1c, 2.02.1d
BLAND	2.10.1c

EXECUTIVE

2.01.1b, 2.01.1e, 2.04.1d, 2.10.1d, 2.10.2a 4.2.3c, 7.3.1b
